26 MAY 1960

ONE SHILLING
AND SIXPENCE

ELECTRICAL TIMES

THE WORLD'S LARGEST NATURAL-CIRCULATION BOILER

MW

Babcock Radiant, reheat type, pulverized-fuel-fired, with an evaporation of 3,750,000 lb. hr. at 2400 lb. sq. in. 1055 F. for THORPE MARSH power station, Central Electricity Generating Board.

MW

200 MW

Radiant units, pulverized-fuel-fired, for WEST THURROCK, WILLINGTON 'B' and KINCARDINE (with reheat); and HAZELWOOD (Australia).

100 MW

TO 125

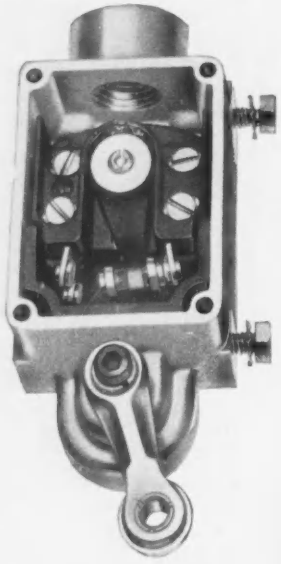
Radiant, reheat units, pulverized-fuel or 'Cyclone' fired, of capacities from 100 to 125 MW, for BLYTH 'A', RUGELEY, USKMOUTH 'B', PADIHAM 'B', FERRYBRIDGE 'B', ASNAES (Denmark), PONT BRULE, FARCIENNES and MOL (Belgium), TIRRENA and CHIVASSO (Italy), KAWASAKI (Japan) and YALLOURN (Australia); also the six 100 MW units at CASTLE DONINGTON power station, which topped the efficiency table in 1959.

Central station boiler development in recent years has been remarkable for the steep rise in unit capacities, with parallel advances in steam conditions and the extensive use of reheat; achieving valuable gains in thermal efficiency. This development reflects intensive progress — in design, engineering and manufacture — by the BABCOCK organization, which has supplied, or is currently manufacturing, a considerable number of boilers of from 100 to 300 MW capacity, and which is now to supply a unit of 550 MW capacity — the first to provide this huge output from a single-furnace natural-circulation design.

BABCOCK
STEAM-RAISING PLANT

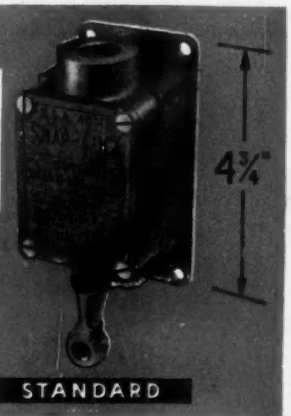
BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, N.W.1.

A STYLE APPLICABLE TO EVERY INDUSTRY



Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.

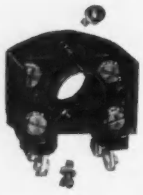
Water Oil and Dustproof or Flameproof versions

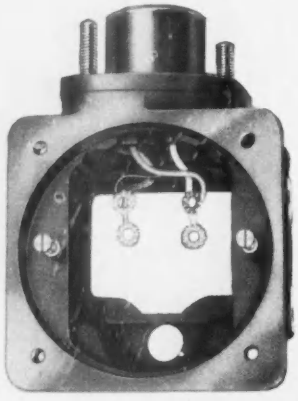


STANDARD

WATER, OIL & DUSTPROOF

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ¾" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.

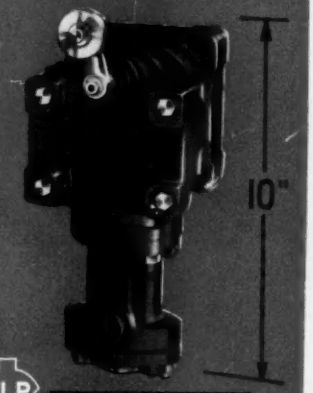




The mechanism of the Flameproof switch is easily removable as a unit for servicing.

Standard Neutral position or Centre connection

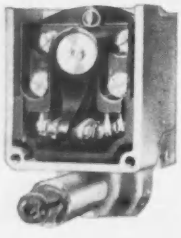
MARK II



FLP FLAMEPROOF

SINGLE OR DOUBLE ENTRY

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts, interchangeable plugs and sockets. ***Single SWA cable entry (standard); double entry if required.*** *Operating lever position adjustable in 7.5 deg. increments through 360 degs. Single pole, double break, having one normally closed and one normally open circuit. Available with central (neutral) position and/or centre connection.*



B.S.A. SNAP-LOCK ACME

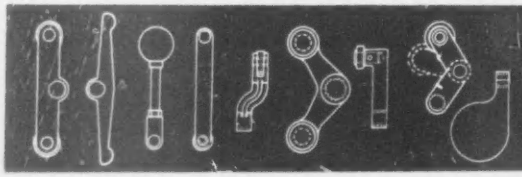
Catalogue of switches and levers on request

HEAVY DUTY LIMIT SWITCHES

Made in England under Licence by B.S.A. SMALL TOOLS LTD., BIRMINGHAM, 11

TRADE MARKS B·S·A TOOLS DIVISION

471



A few examples from the range of more than 40 styles (over 150 sizes) of interchangeable operating levers. List on request.

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Constructional features of this range of Heavy Duty Switches include a Bolt-Lock type positive quick make and break mechanism, with switch blades and contacts of high current carrying and breaking capacity. For full information on the comprehensive range send for detailed literature . . . today.

* send for a copy today!

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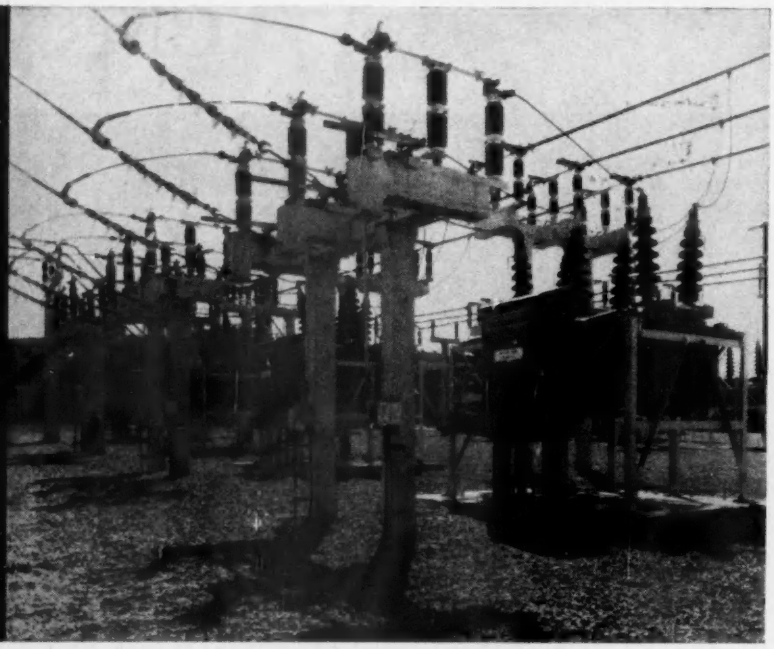
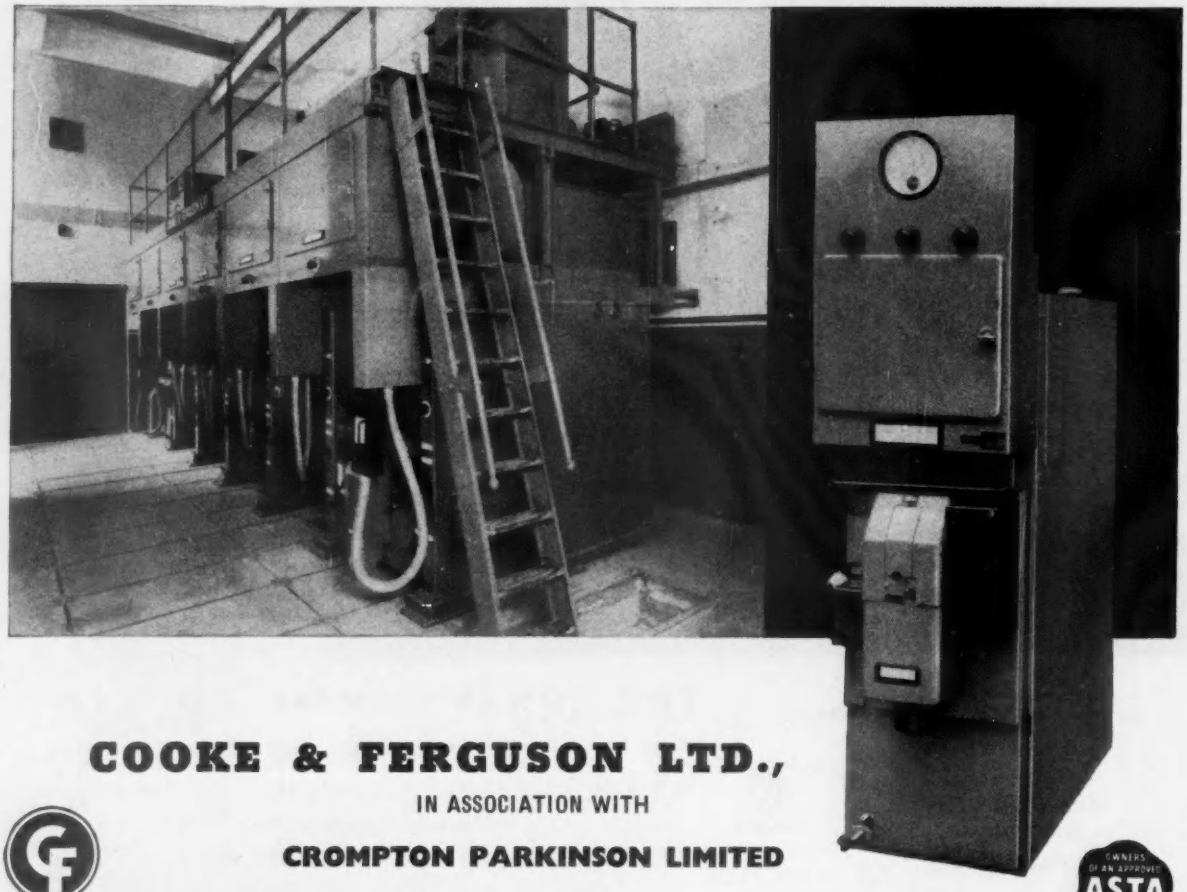
For outdoor or indoor switchgear



. . . up to and including 66kV



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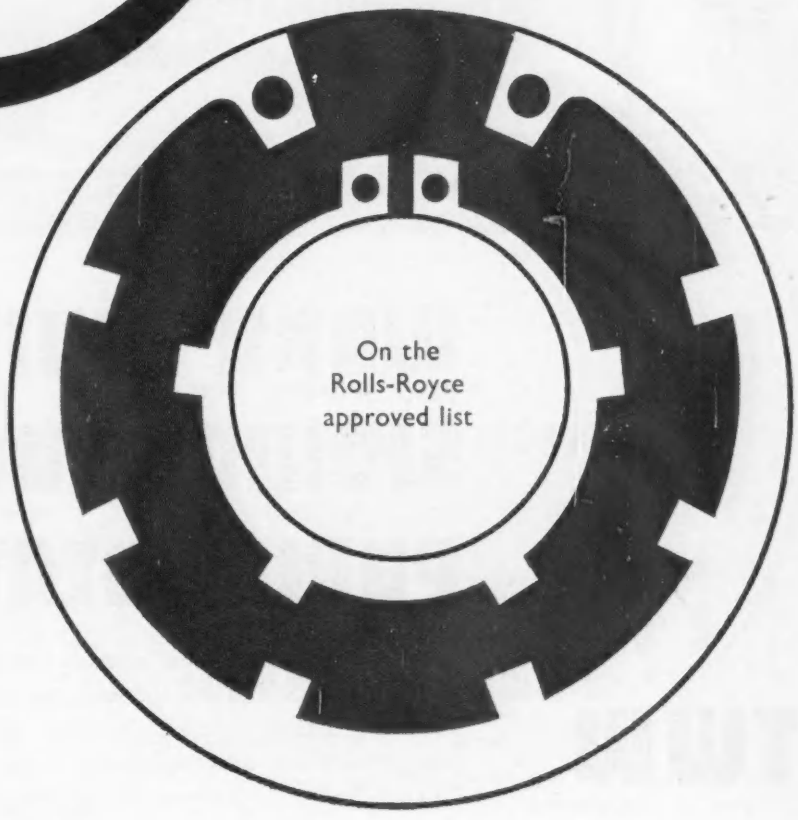

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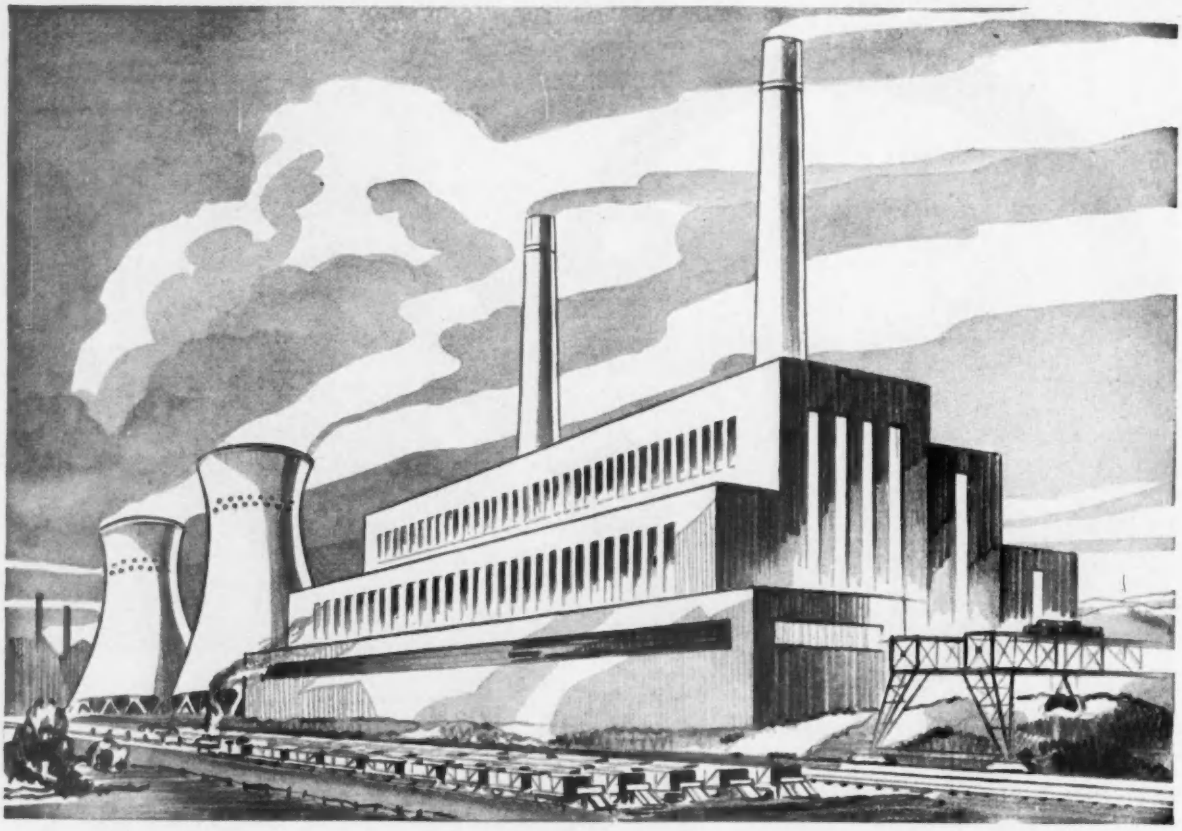

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TWW

Wards have completed siding contracts for power stations at London, Manchester, Fleetwood, Glasgow, Sheffield, Blackburn, Oldham, Bold and Dewsbury, laying many miles of track with numerous turnouts, cross-overs, etc. Two free booklets—"Railway Sidings by Wards" and "Rails and Rail Accessories"—give a more detailed account of this side of Ward's Service to Industry.

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SC/46

ANNOUNCING

INTERNATIONAL POWER AND ENGINEERING CONSULTANTS LIMITED

IPEC

In January, 1960, International Power and Engineering Consultants Limited – IPEC – became the new corporate name of B.C. and B.B. Power Consultants Limited of Vancouver, Canada. In addition, as from April 1st, 1960, IPEC assumed the functions and responsibilities of B.C. Engineering Company Limited of Vancouver, Canada, together with the Vancouver office of Balfour, Beatty & Co., Limited of London, England. This consolidated organization will offer comprehensive engineering facilities and, through its association with the well-known, well-established firm of Balfour, Beatty & Co. (Overseas) Limited, its services are available throughout the world.

INTERNATIONAL POWER AND ENGINEERING CONSULTANTS LIMITED IPEC

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"What goes up MUST COME DOWN"

"but not WOOTTON METER BOARDS Sir"

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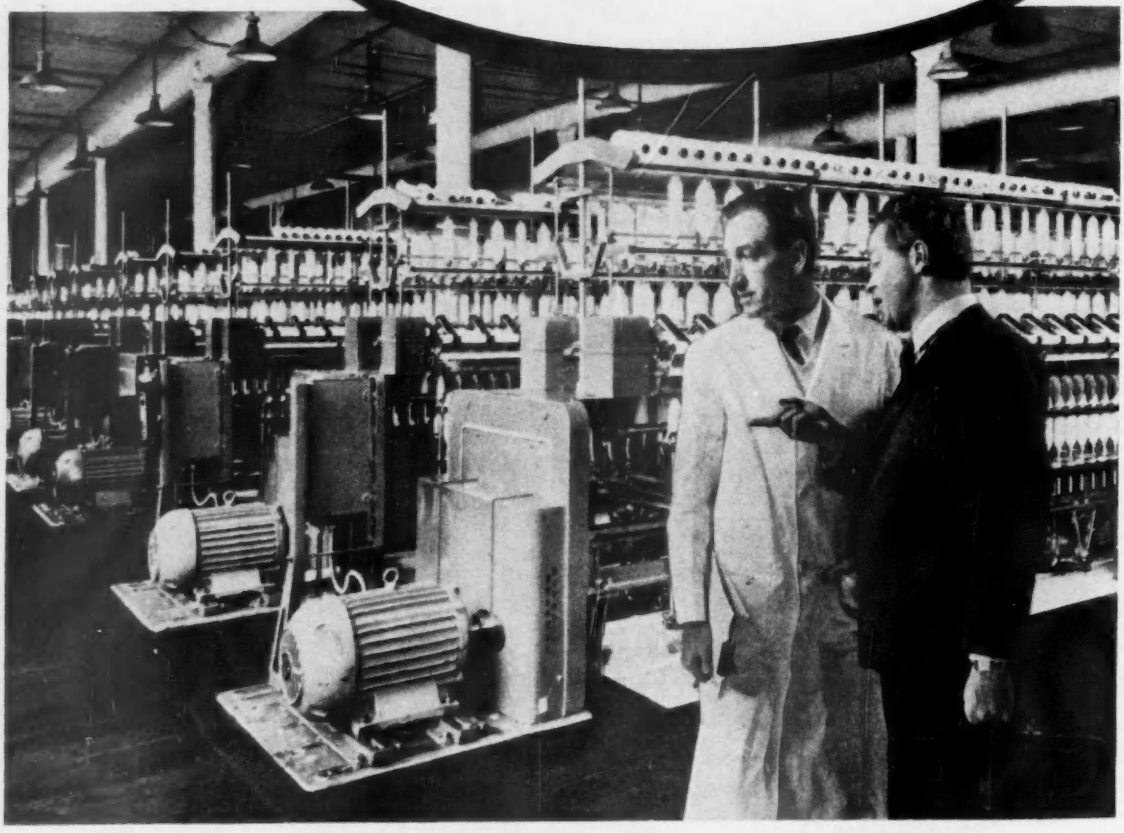
AEI engineers know the Textile Industry



There are AEI engineers who specialise in the Textile Industry.
By working closely with the industry over many years they have virtually become a part of it. They study its problems closely, and are always at hand to advise on electric drives and control equipment. Call on them at any time. They will assist you with everyday plant problems or the planning of major projects.

AEI ELECTRIC DRIVES

AEI

Associated Electrical Industries Limited
Motor and Control Gear Division
RUGBY AND MANCHESTER, ENGLAND

INCORPORATING THE MOTOR AND CONTROL GEAR INTERESTS OF BTH AND M-V

A5413

It's aluminium

Sheathed in *seamless* extruded aluminium, this cable is lightweight yet strong. It needs no armouring, thus allowing simple cable design. With a high resistance to vibration fatigue, it can be used with complete safety, alongside railways etc.

It's flexible

Corrugation results in greater flexibility, permitting the same bending radius as a lead sheathed cable. Not only are handling qualities improved but corrugation reduces the required thickness of the sheath *by one half*.

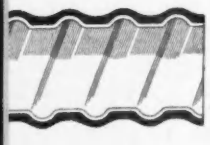
It's a money saver

Initial costs are therefore lower than conventional type cables of similar performance. Lightness and flexibility simplify transportation and installation. No special precautions are necessary to allow for expansion and contraction.

Further information is available on request.

It's the BICC C.S.A. cable

CORRUGATED
SEAMLESS
ALUMINIUM



PROTECTIVE SERVING

Anti-corrosion protection is provided by an extruded P.V.C. covering which fits tightly over the whole sheath surface. *See section view.*

INSTALLATION

Conventional installation procedure is followed. Jointing techniques are the same as for normal smooth aluminium-sheathed cables.

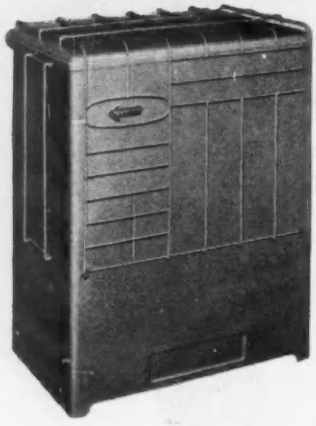
CABLE TYPES

C.S.A. sheathing is available with BICC Mass - Impregnated Non - Draining (M.I.N.D.) Cables up to 33kV and for Oil-Filled Cables.

BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON W C 1

Use Off-Peak Tariffs and cut the cost of Heating with

Nightstor Heaters



CUT FUEL COSTS. Nightstor Heaters store heat by night—taking advantage of the cheaper off-peak tariffs available from all Electricity Boards—and dissipate heat by day. Separate thermostatic control ensures that the heaters use only the minimum current necessary to provide a comfortable temperature throughout the following day from first thing in the morning. Thus Nightstor Heaters are not only efficient and clean, they represent maximum economy.

CUT CAPITAL COSTS. Simple and inexpensive to install, without alteration to structures or fittings. Nightstor Heaters are compact units which can be safely placed right up against the wall. Thus using the minimum of floor space.

CUT MAINTENANCE COSTS. Controlled automatically, Nightstor Heaters once installed need no maintenance or attention.

Nightstor is a G.E.C. product

(Not available for domestic use)

The G.E.C. specialises in industrial heating and manufactures every type of appliance.
Make use of our free advisory service without obligation.

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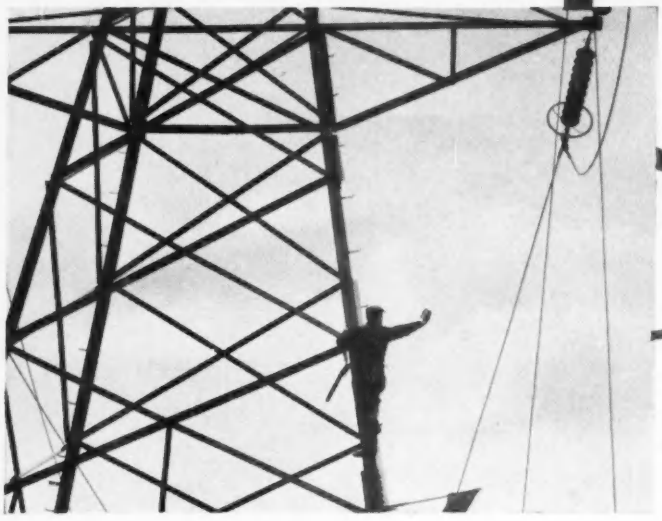
* Safety first

WITH THE "METRAC"

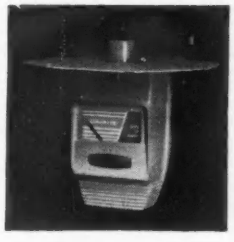
live line indicator



The illustration above shows the "METRAC" in use when checking one circuit of a double circuit 132 kV overhead line prior to earthing. (Photo by courtesy of Central Electricity Generating Board.)

An entirely new approach to an old problem, that of live line detection to satisfy "safe to work" rules. No contact with the conductor is necessary as the "METRAC" detects the electrostatic field set up by a conductor energised by an A.C. voltage. The pointer gives a clear unambiguous indication of danger or safety against an illuminated red and green indicator plate suitably inscribed. Push button operated, small in dimension and weighing less than 2 lb, it is a one-hand instrument.
Available for overhead lines, busbars, conductors and switchgear up to 275 kV.

On the right is shown a model adapted for use at the spouts of draw-out or drop-down metalclad switchgear up to 66 kV. In this the detecting probe is extended and a shield prevents insertion beyond the mouth of the spout.



Manufactured under licence from the Central Electricity Generating Board and accepted by the National Committee for the Approval of Voltage Testing Devices. Is the subject of patent applications both in Great Britain and abroad.

* *This new instrument is fully described in Catalogue Sheet 255B. Please write for your copy.*

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ONE AMP ***50 volts to 400 volts P.I.V.***

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FIVE AMP ***50 volts to 400 volts P.I.V.***

- *Available from production*
- *High Efficiency*
- *Small Size*
- *High Temperature Operation*
- *Hermetically Sealed*

STC COMPONENTS GROUP

60 3MF

Standard Telephones and Cables Limited

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RECTIFIER DIVISION: EDINBURGH WAY · HARLOW · ESSEX

The transformers and summation metering panels are for these sites.

TRANSFORMERS

All the sub-station transformers for the Kariba Hydro-Electric Scheme are being supplied by Ferranti Ltd. They comprise two 120,000 kVA, 330/234 kV 3-phase auto transformers with series boosters, eight 60,000 kVA, 330/88 kV and four 60,000 kVA, 330/33 kV 3-phase double wound transformers. The transformer installations at Norton, Lusaka and Kitwe are complete. Work at Salisbury, Bulwayo and Sherwood is well advanced.

SUMMATION METERING

For the same scheme Ferranti Ltd. are supplying Summation Metering Equipment comprising: Precision grade integrating meters, Electro-mechanical summators, Printometer Demand Recorders and Suites of metering cubicles. These equipments will be used to meter six 100 MW generator sets at Kariba Power Station and also the supplies to the Transforming Stations at Kitwe, Norton, Salisbury, Lusaka, Sherwood and Bulawayo.

The consulting electrical and mechanical engineers are Messrs. Merz & McLellan.

Ferranti

FERRANTI LTD · HOLLINWOOD · LANCASHIRE Tel: FAIlsworth 2000

One of the two Ferranti 120,000 kVA 330/234 kV auto transformer and series booster installations at the Kitwe sub-station.

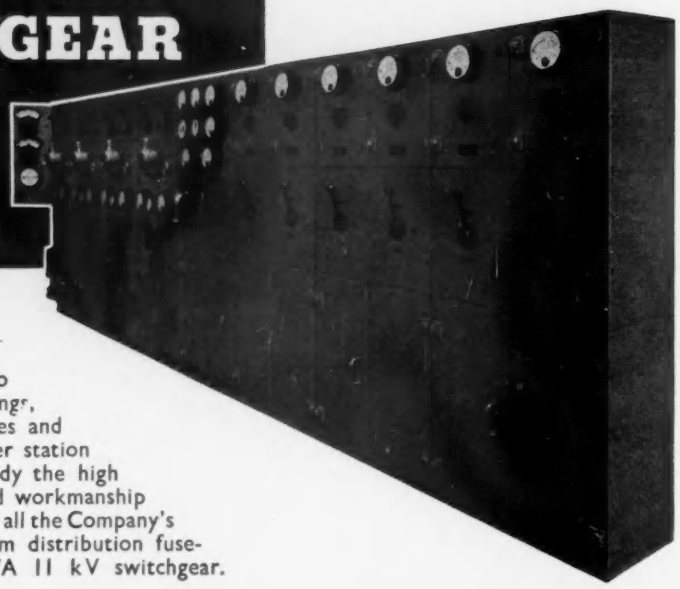
FERRANTI AT KARIBA

Ferranti Generator Metering Panels for the Kariba Power Station

London Office: KERN HOUSE · 36 KINGSWAY · W.C.2 Tel: TEMple Bar 6666

FG 308/2

CUBICLE TYPE
SWITCHGEAR
MEDIUM
VOLTAGE



Switchboards of this type have been supplied to hospitals, public buildings, banks, industrial premises and for the control of power station auxiliaries. They embody the high standard of design and workmanship which is to be found in all the Company's products ranging from distribution fuse-boards to 250 MVA 11 kV switchgear.

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London Office & Warehouse:—6 London Road, Brentford, Middlesex Telephone: Isleworth 8133/4

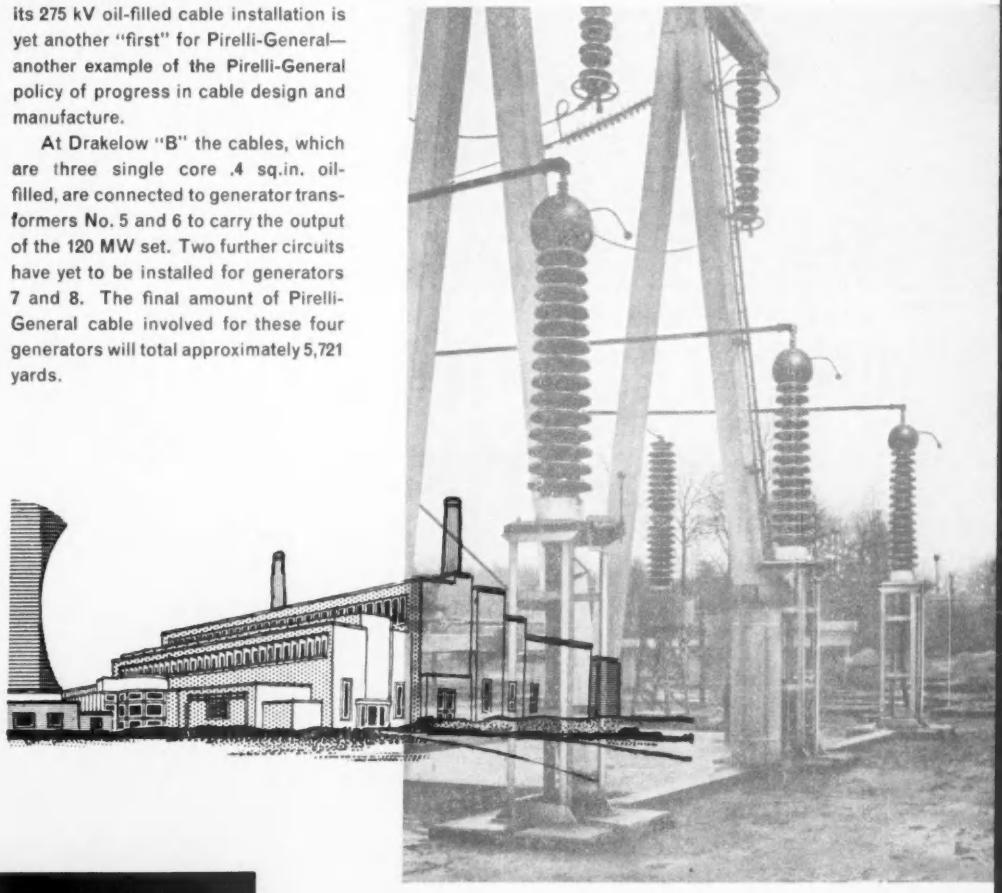
SR22

another pg *'first'*

Drakelow 'B' Power Station with its 275 kV oil-filled cable now in actual commercial operation

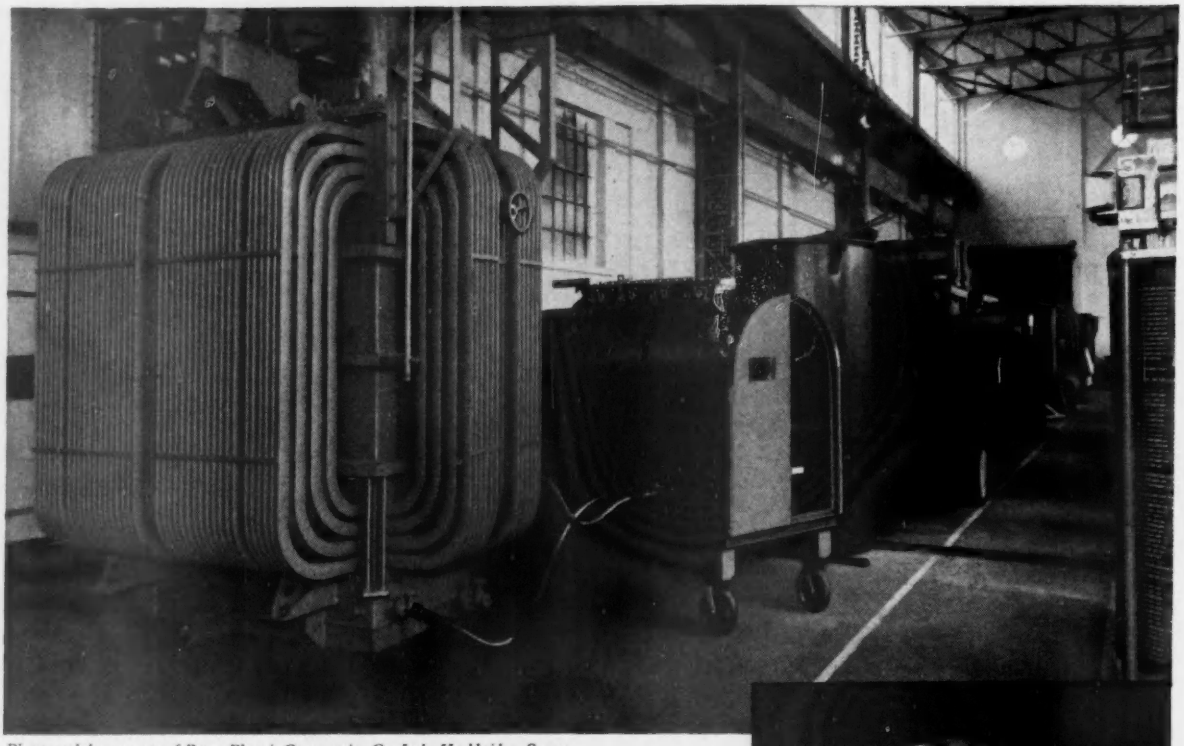
Drakelow "B" Power Station with its 275 kV oil-filled cable installation is yet another "first" for Pirelli-General—another example of the Pirelli-General policy of progress in cable design and manufacture.

At Drakelow "B" the cables, which are three single core .4 sq.in. oil-filled, are connected to generator transformers No. 5 and 6 to carry the output of the 120 MW set. Two further circuits have yet to be installed for generators 7 and 8. The final amount of Pirelli-General cable involved for these four generators will total approximately 5,721 yards.



PIRELLI-GENERAL CABLE WORKS LIMITED

SOUTHAMPTON AND EASTLEIGH



Photograph by courtesy of Bryce Electric Construction Co. Ltd., Hackbridge, Surrey.

A GOOD START IN LIFE

for insulating oil

STREAM-LINE FILTERS ENSURE SECURITY IN THE OPERATION OF CIRCUIT BREAKERS & TRANSFORMERS

New transformers and circuit-breakers need careful cleaning and drying, and must be filled with clean, dry oil. That is why so many manufacturers have installed Stream-Line filters in their works for filling transformers before they are tested and despatched.

It is also advantageous to filter insulating oil when transformers and circuit-breakers arrive on site, for at this stage no amount of care can be excessive. Subsequent periodic maintenance of the oil is also essential to security of insulation. Outstandingly important when considering security and maintenance is the fact that passage through a Stream-Line filter ensures the elimination of *all* solid impurities including the finest colloidal carbon and, in addition, the removal of all free and dissolved gases. The dielectric strength of the filtered oil is far greater than that specified for the highest quality new oil.

There is a Stream-Line filter installation or mobile unit to suit every requirement—please write for further details.

HIGH VACUUM

The standard Stream-Line filters working at moderate vacuum are fully adequate for most requirements but in order to cater for exceptional cases models are also available to operate under high vacuum. Treatment under conditions approaching absolute vacuum, combined with the unique Stream-Line edge-filtration principle, gives results with regard to the elimination of the last traces of air and moisture which are quite remarkable. Send us particulars of *your* special requirements.

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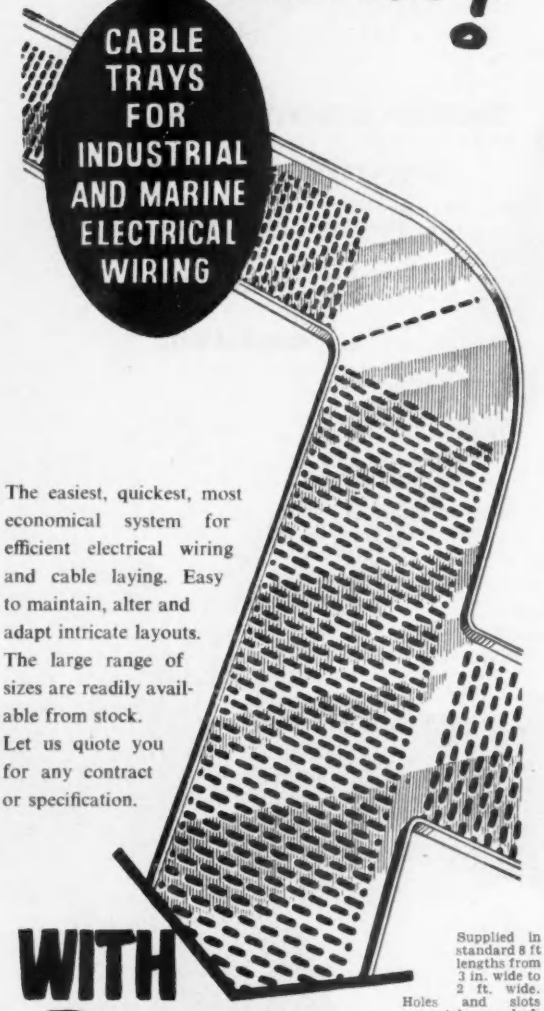
SF184

NO DIFFICULTY AT ALL!

CABLE TRAYS FOR INDUSTRIAL AND MARINE ELECTRICAL WIRING



The easiest, quickest, most economical system for efficient electrical wiring and cable laying. Easy to maintain, alter and adapt intricate layouts. The large range of sizes are readily available from stock. Let us quote you for any contract or specification.

Supplied in standard 8 ft lengths from 3 in. wide to 2 ft. wide. Holes and slots accurately punched. Half inch flange both sides gives extra rigidity.

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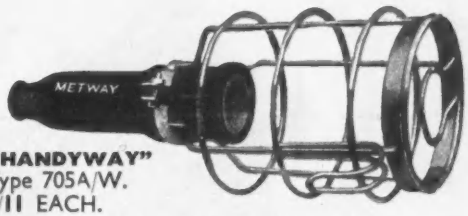
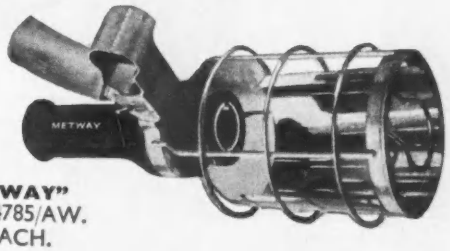


"HANDYWAY"
Type 705A/W.
8/11 EACH.
Type 2705/AWS with switch. 11/11 each.



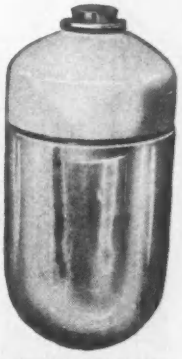
"GRIPWAY"
Type 4785/AW.
14/8 EACH.

ALL INSULATED BULKHEAD and WELL GLASS FITTINGS

Type 2682/PH Plastic diffuser	40 watts 10/6 each
Type 2650/PH With glass	60 watts 9/8 each
Type 2650/PH With glass	100 watts 13/8 each

"LIGHTERWAY"
WELL GLASS FITTINGS
With porcelain tops tapped ¾" conduit

Type 917 PH	60 watt	12/4
Type 918 PH	100 watt	17/8



WITH REFLECTOR
Type 918/5647
60 watt 16/8

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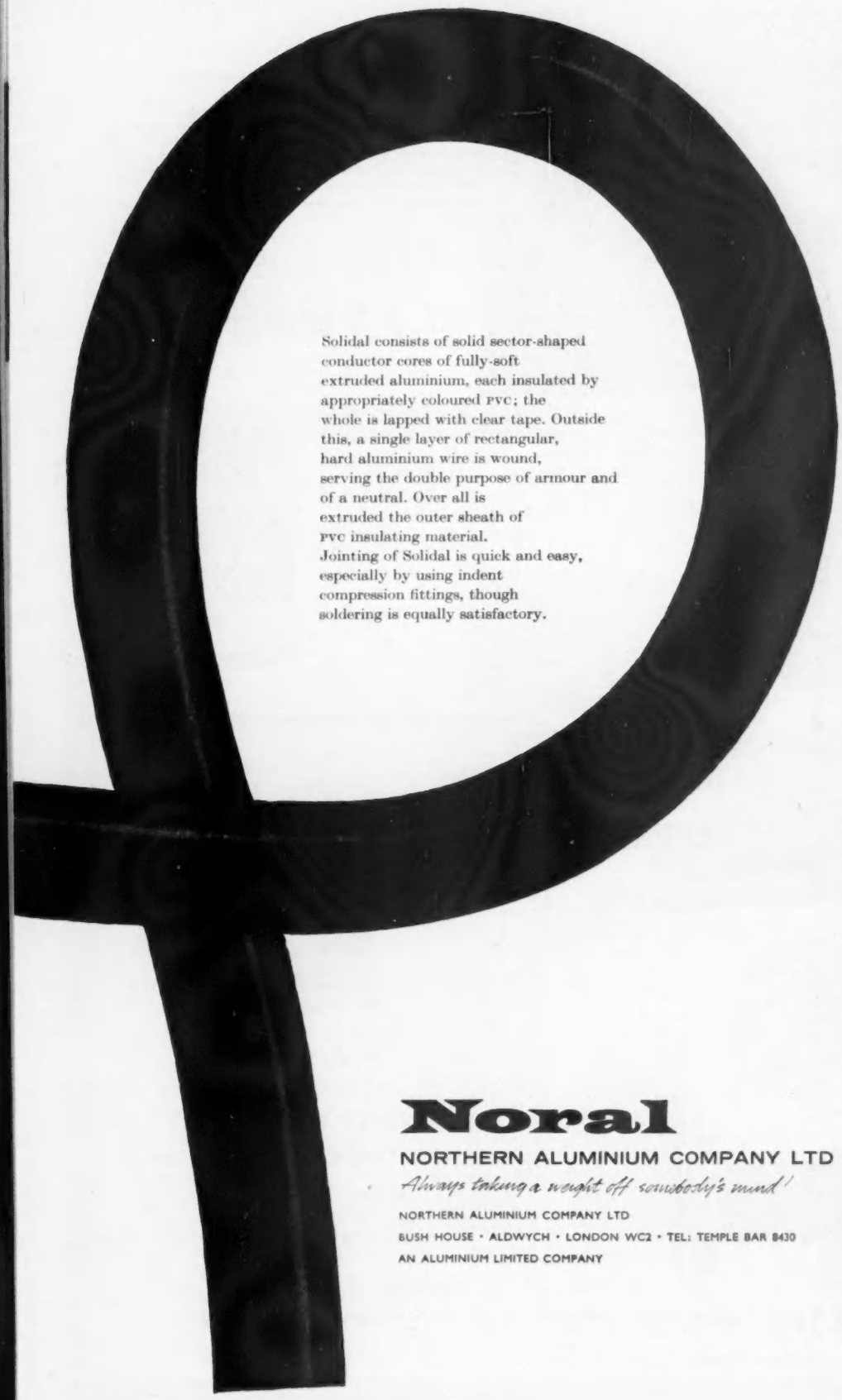
The design and development of Solidal are an example of the forward thinking and research resources of the companies in the Aluminium Limited Group. We do not ourselves make or market Solidal, but will gladly send you further information, including the names of suppliers.

If you have a specific problem, in any field, that aluminium might solve, why not get in touch with Noral?

SOLIDAL

- Economical
- Readily manipulated
- Easily jointed



Solidal consists of solid sector-shaped conductor cores of fully-soft extruded aluminium, each insulated by appropriately coloured PVC; the whole is lapped with clear tape. Outside this, a single layer of rectangular, hard aluminium wire is wound, serving the double purpose of armour and of a neutral. Over all is extruded the outer sheath of PVC insulating material. Jointing of Solidal is quick and easy, especially by using indent compression fittings, though soldering is equally satisfactory.

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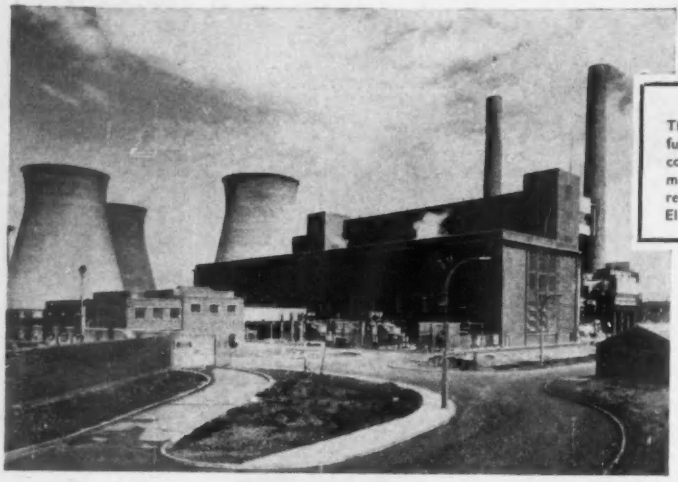

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The Ince Power Station, which is equipped to burn heavy fuel oil as an alternative to pulverised coal, is the first in this country with boilers of semi-outdoor construction. The motors driving the auxiliaries are protected by P & B Golds relays in this and many other power stations of the Central Electricity Generating Board.

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P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.
P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.
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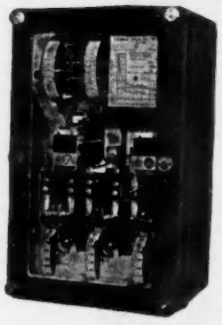
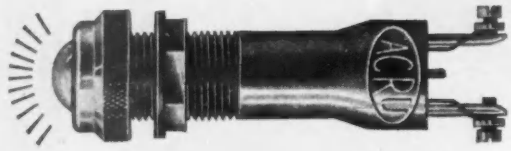


P&B PROTECTION RELAYS

THE P & B ENGINEERING CO. LTD
CROMPTON WAY · CRAWLEY · SUSSEX *Crawley 1004*

ACRU NEON INDICATOR LAMPS



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Average life 25,000 hours.
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Voltages from 60 to 440.

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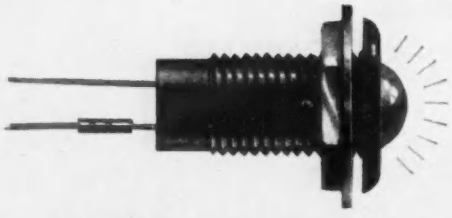

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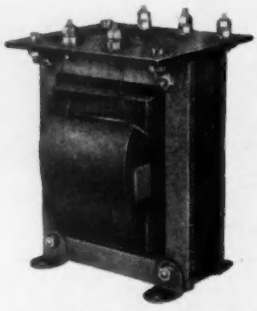
Acru Works, Demmings Road, Councillor Lane, Cheadle, Cheshire. *Tel., GATLEY 6058*



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10VA to 1,500VA
to B.S. and J.I.C. Specifications

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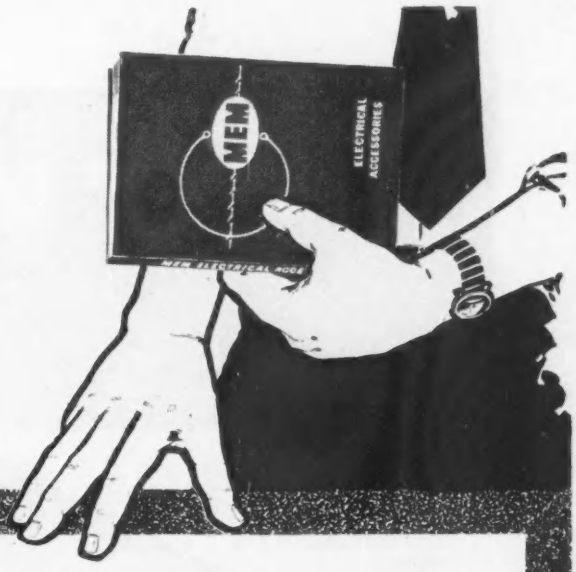
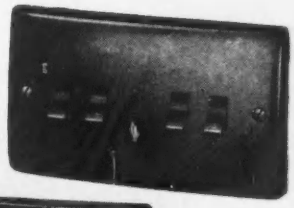
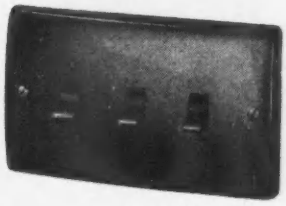
Electrical accessories from the MEM range



MEM "TAY" flush plate/switches and bell pushes

- All insulated. Current carrying parts mounted on high-grade vitreous porcelain.
- Solid Silver contacts.
- Modern styling eliminates dust traps.
- Plate and switch form a one-piece unit, self adjusting to varying plaster levels.
- Brown or ivory finish.


724 TFB


723 TFB

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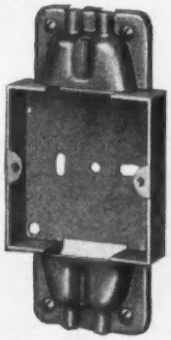
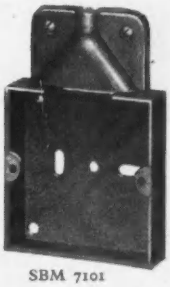
MEM "TAY" plaster depth boxes

- Wood, moulded and steel.
- Steel boxes available with insulated lugs adjustable for alignment.
- A range of steel boxes available with special clamps for M.I.C.C. cables.


SBM 7122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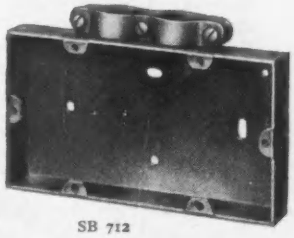
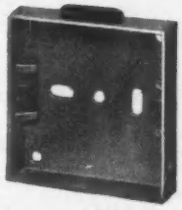

SB 712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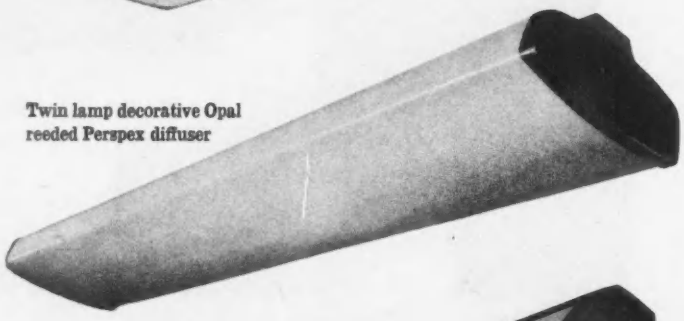
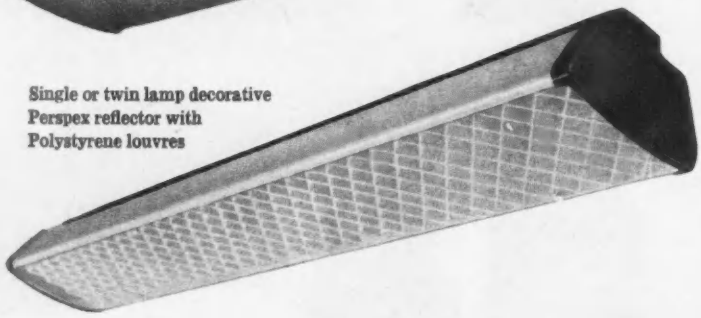
It's REVO versa-line

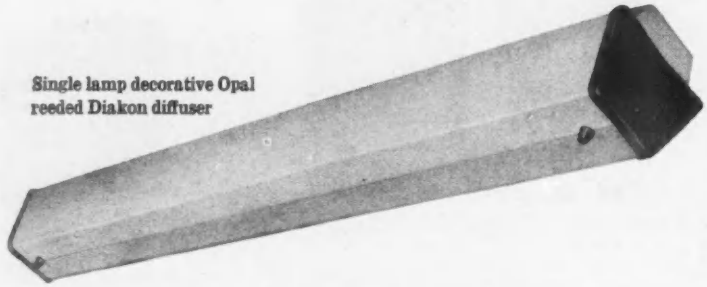
Twin lamp closed end steel reflector



Twin lamp decorative Opal reeded Perspex diffuser



Single or twin lamp decorative Perspex reflector with Polystyrene louvres



Single lamp decorative Opal reeded Diakon diffuser

Simple to install, amazingly versatile

The basic channel common to the new quality Versa-line range contains REVO POLYESTER CONTROL GEAR and is supplied with BI-PIN end pressure lampholders which enables lamp replacement from either end of fitting.

Various reflectors and/or diffusers can be readily added owing to simple attachment method.

The basic batten fitting consists of a formed sheet steel channel finished in quality stove enamel with moulded end caps and a reflector plate secured by easy-release fasteners.

Where dispersive light distribution is needed, open or closed end steel reflectors in various finishes, or of opal perspex, may be attached by the same method. Separately detachable louvres are available for the closed end reflectors. Steel reflectors may be supplied, slotted to permit upward illumination.

For the decorative range, a reflector plate of extended width is provided. It carries a selection of diffusers which are, instantly, detachable for lamp replacement.

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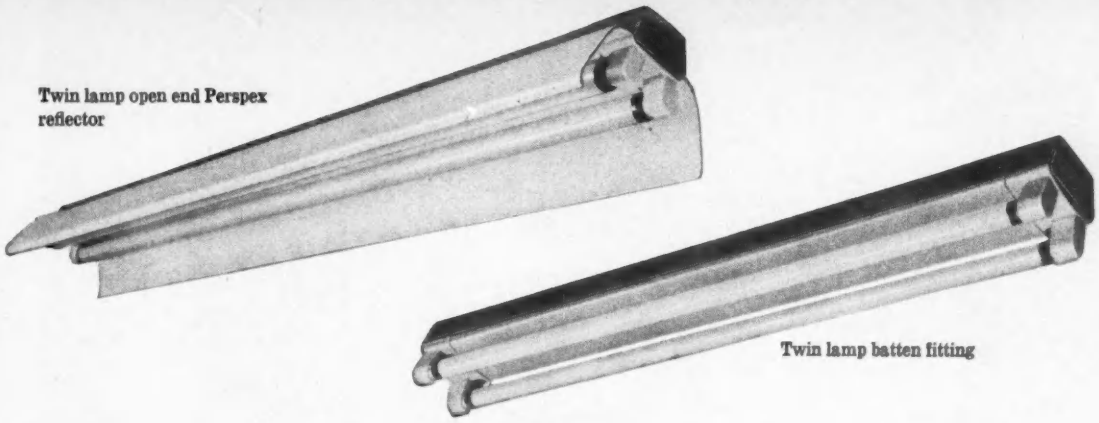
MADE BY REVO ELECTRIC CO. LTD., INDUSTRIAL DIVISION, TIPTON, STAFF

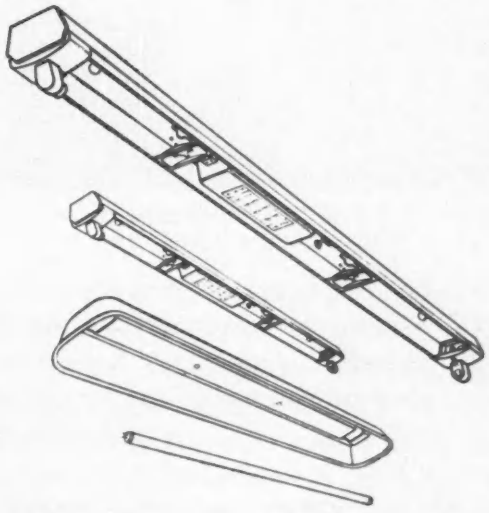
for today's fluorescent fittings!



Twin lamp open end Perspex reflector

Twin lamp batten fitting

LOOK AT THESE FEATURES:



1. **Basic channel containing Revo Polyester control gear.**

2. **One-piece pressed-steel reflector,** *again readily detachable for maintenance by means of easy-release fasteners.*

Note: A system of continuous trunking is available for complete lighting installations.

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OUTDOOR SWITCHGEAR

FOR SEMI-HAZARDOUS AREAS

Photograph by courtesy of Shell International Petroleum Co. Ltd.

One of a large number of Motor Starter Switchboards, non-sparking, installed 15 miles off-shore on Oil Gathering Stations in Lake Maracaibo (salt water), Venezuela. These switchboards are completely weatherproof and operate under the most exacting climatic conditions conceivable.

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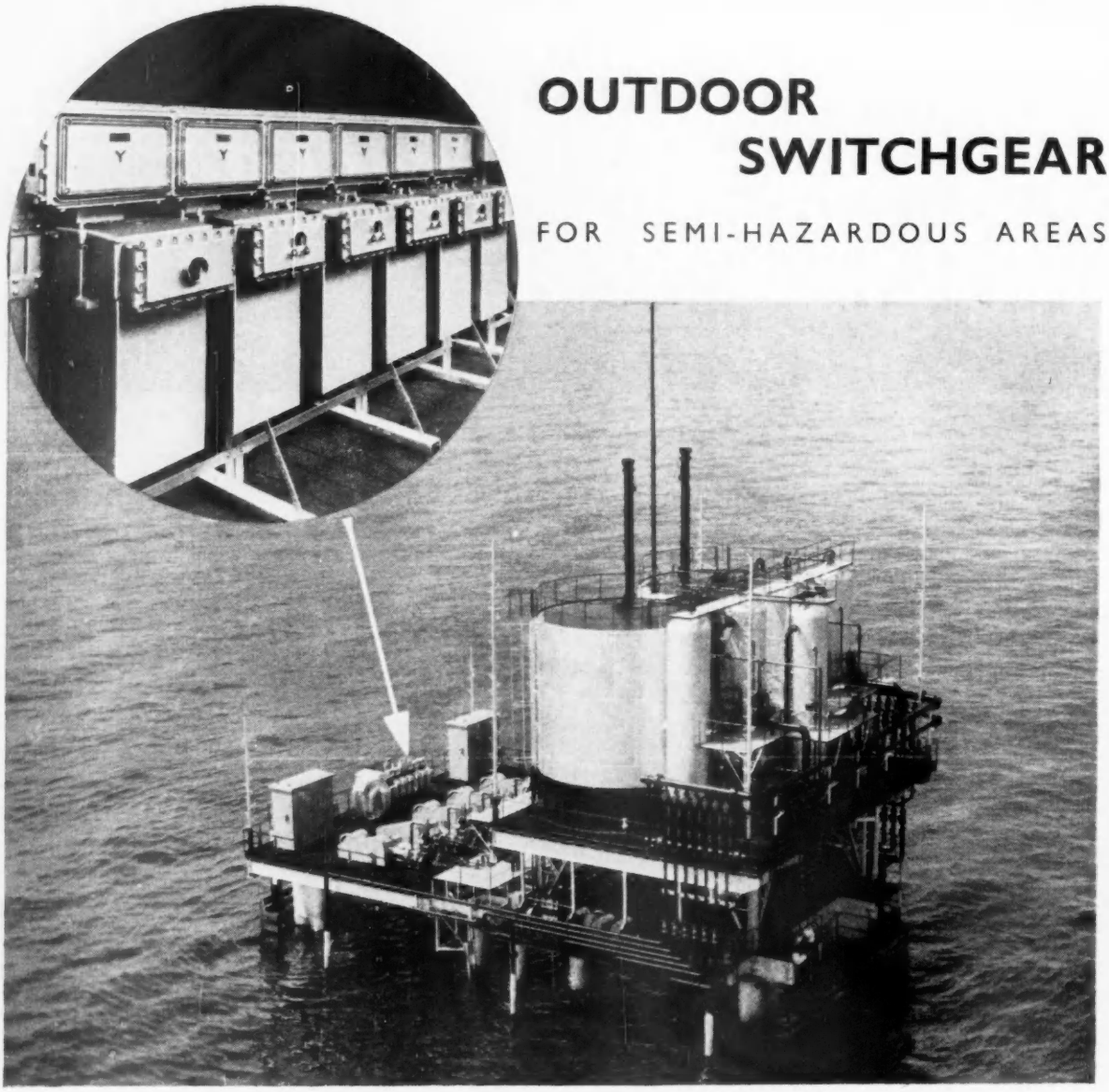
OUTDOOR SWITCHGEAR

FOR SEMI-HAZARDOUS AREAS



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C

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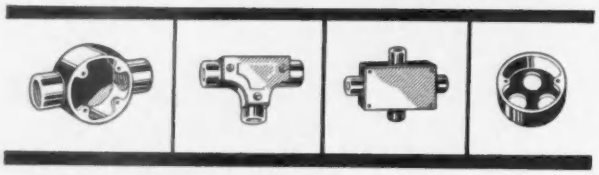

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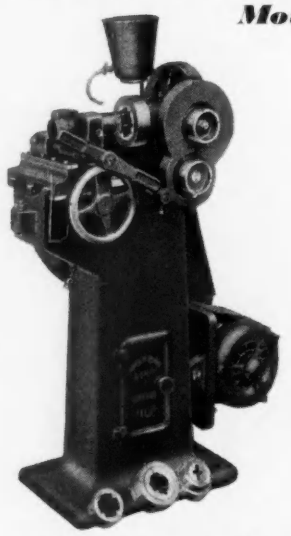

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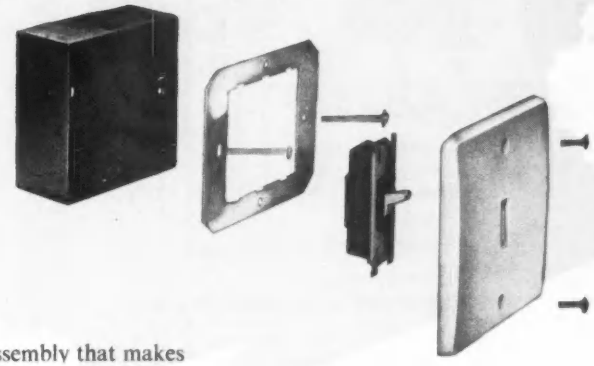

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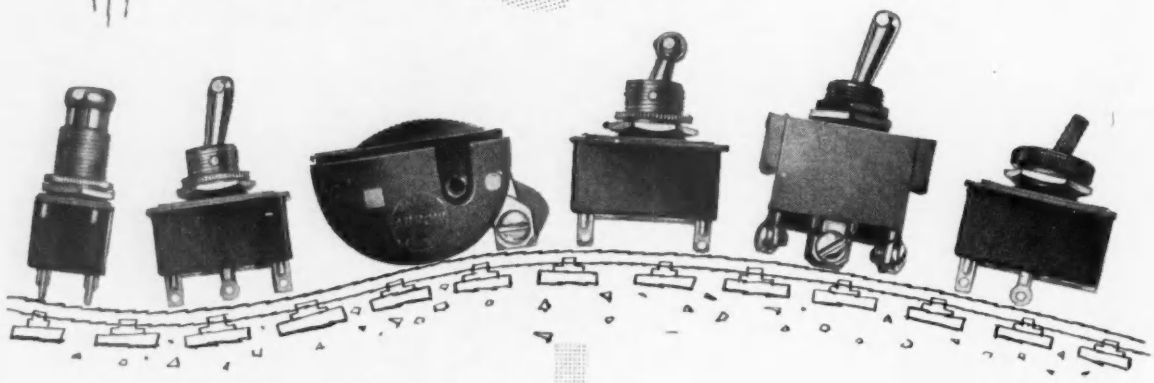

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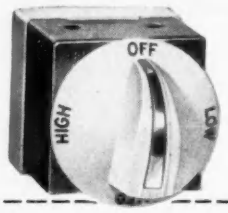

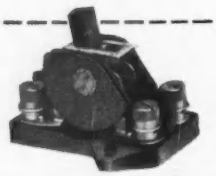

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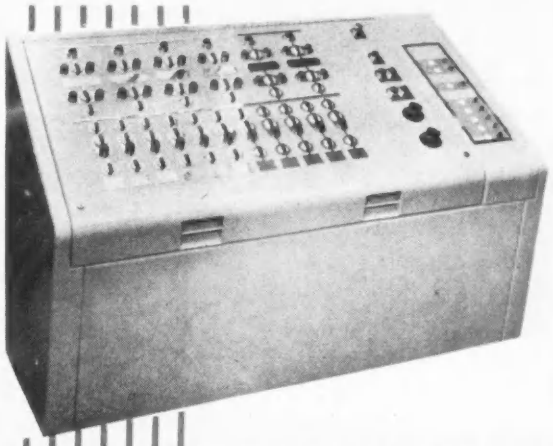

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★ Multi-Station two-way calling system.

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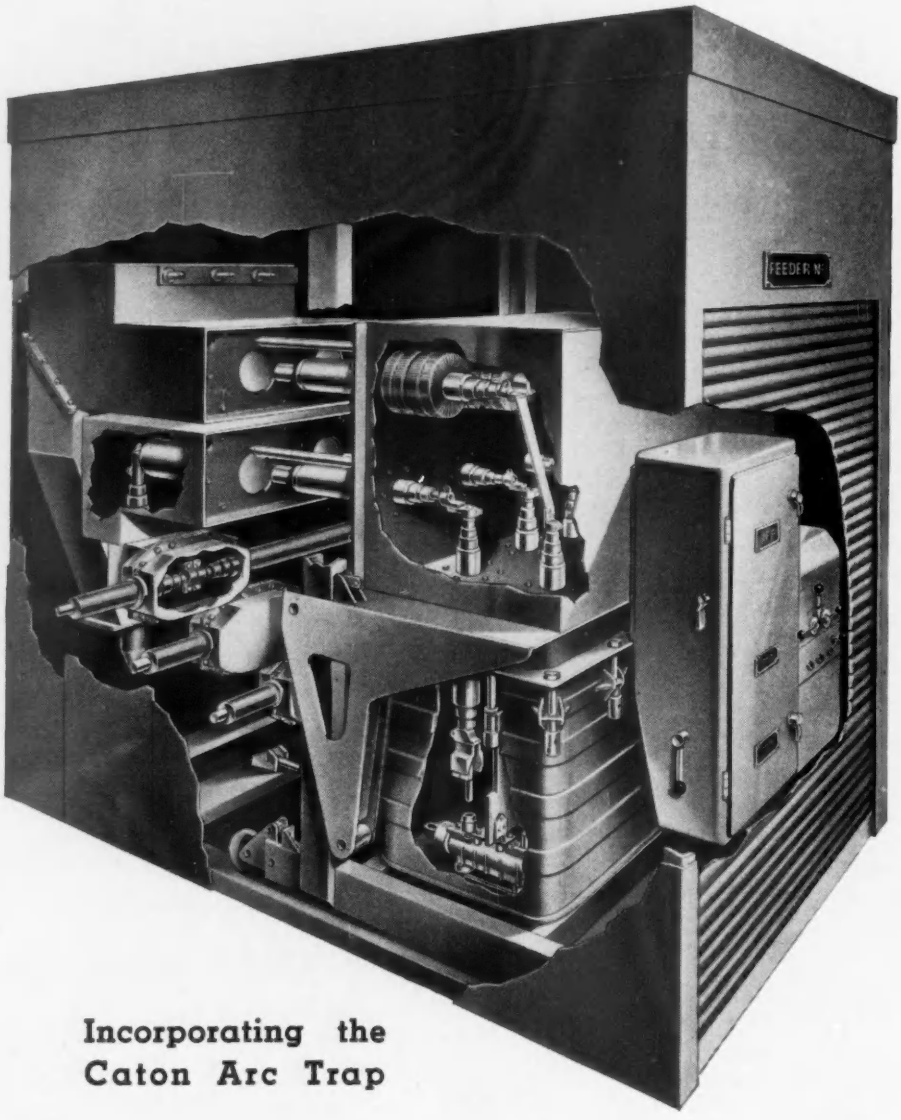

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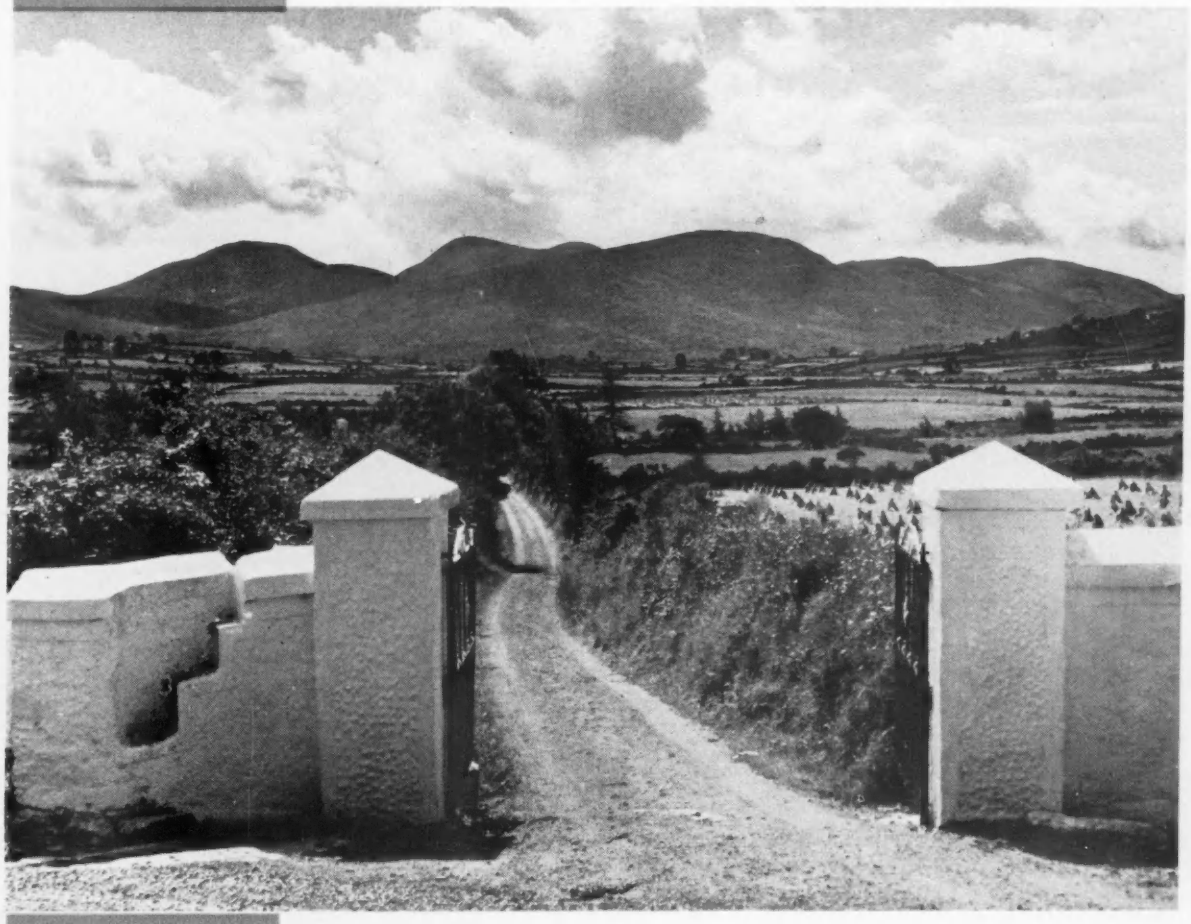
'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.

(Pleasures of Hope by Thomas Campbell)



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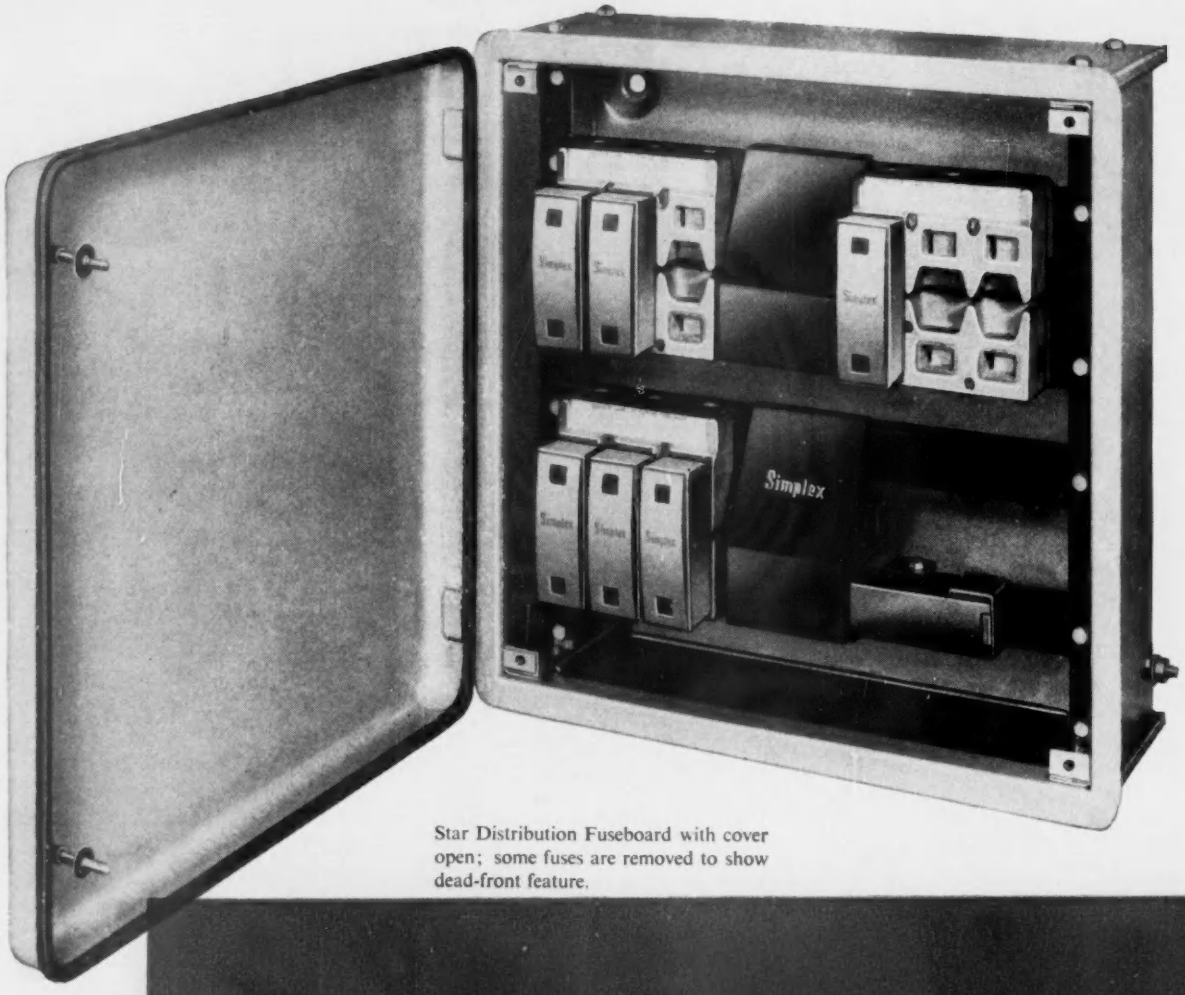
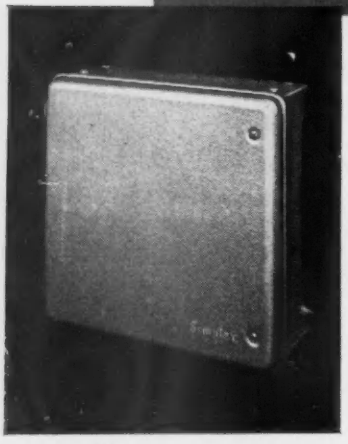


Star Distribution Fuseboard with cover open; some fuses are removed to show dead-front feature.

Simplex



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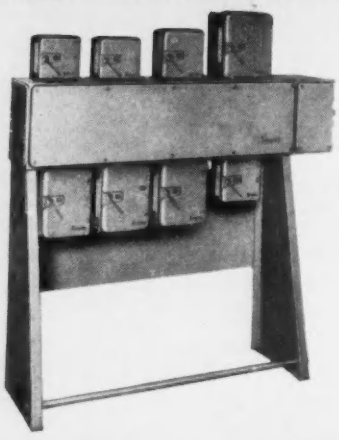

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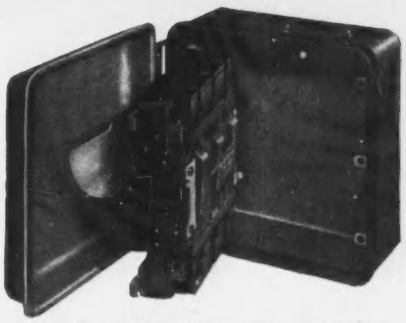

Star Switchfuse with cover open showing interior hinged forward for ease of wiring. Range: AC 500 volt, 15, 30, 60 amp. DC 250 volt, 10, 20, 30 amp.

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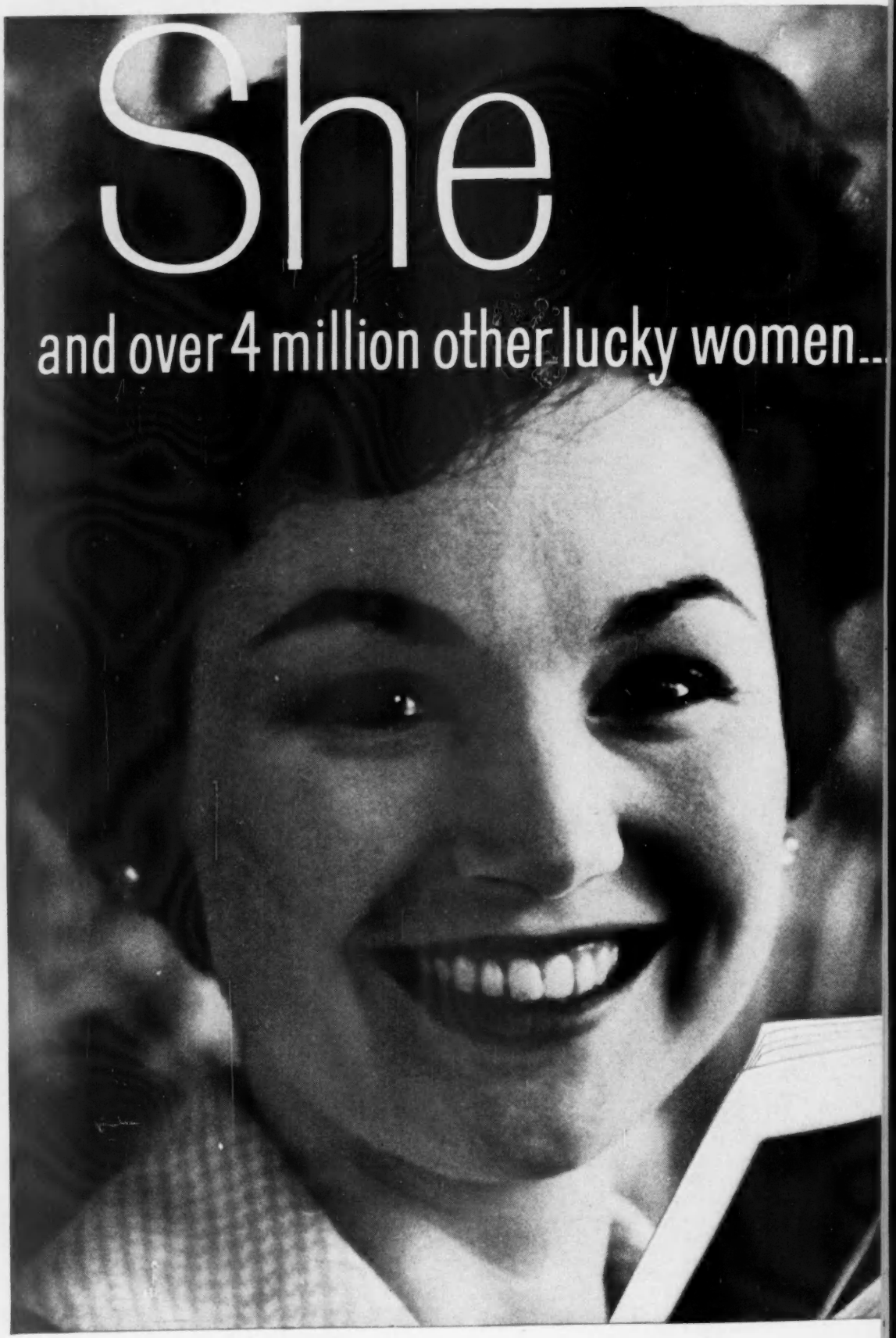
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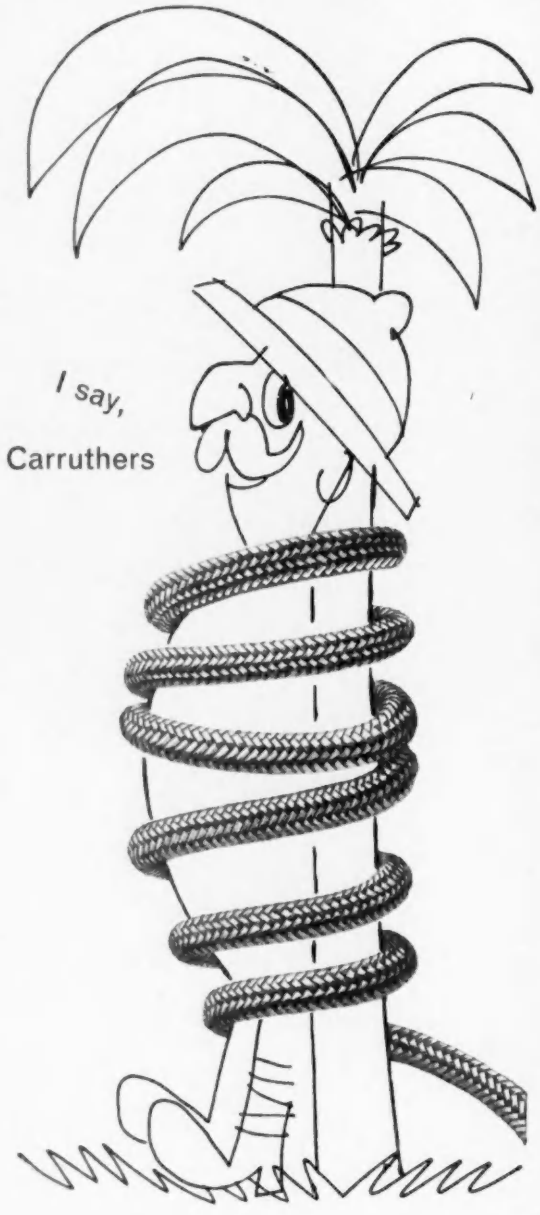

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ELECTRICAL TIMES

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by J. Griffin, A.M.I.E.E.

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Dans ce numéro

Générateurs alternatifs pour navires 837
La plupart des alternateurs de marine destinés à alimenter des appareils auxiliaires de navires sont du type à pôle saillant et à champ tournant. Les générateurs principaux sont généralement des machines à grande vitesse, ayant des rendements de l'ordre de 300 à 1.500 kW, du type de construction ventilée et à l'épreuve des égouttures. L'auteur de l'article est en faveur des circuits de refroidissement fermés, avec échangeurs de température. Une réaction transitoire est importante, des chutes de tensions de 15 à 20% étant acceptables pour les navires marchands et pétroliers, et de 5 à 10% dans les paquebots. Les alternateurs auto-régulateurs, dans lesquels il n'y a pas de régulateur de voltage automatique externe et mis en mouvement par les erreurs, sont mis en usage et donnent une réaction transitoire de voltage supérieure et une capacité de surcharge passagfère plus élevée.

Sûreté de fonctionnement du matériel électronique 855
Une conférence d'ingénieurs électroniques à Londres a discuté des normes de sûreté obtenues avec le matériel d'aujourd'hui. Il est généralement reconnu que la majorité des lampes thermoïoniques fabriquées à présent ont des niveaux raisonnables de sûreté et de durée, mais u'il a été établi que les causes principales de défaillances du matériel proviennent d'éléments tels que condensateurs, résistances, etc., qui doivent être plus sûrs pendant des périodes d'utilisation plus longues. On se plaint que les fabricants de semi-conducteurs semblent peu désireux de fournir des renseignements su sujet de la sûreté de leurs produits.

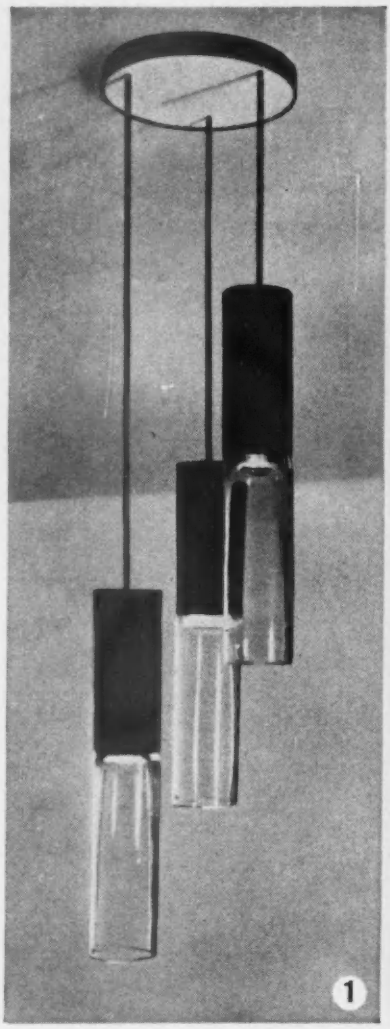
Progrès dans les recherches physiques 857
Des travaux rapportés par le 'National Physical Laboratory' du Gouvernement comprennent la construction d'un nouvel étalon de grande résistance, l'étude des crachements périsphériques sur des isolateurs aériens mouillés et des recherches sur la traduction mécanique du russe en anglais.

In dieser Nummer

Schiffs-Wechselstromgeneratoren 837
Zur Erzeugung der Antriebsleistung für Hilfsmaschinen auf Schiffen werden meistens Wechselstromdrehfeldmaschinen mit ausgeprägten Polen verwendet u. zw. werden als Hauptstromerzeuger normalerweise hochtourige, gelüftete, tropfwassersichere Maschinen mit einer Leistung zwischen 300 und 1 500 kW auf Schiffen eingebaut. Der Verfasser setzt sich für geschlossene Maschinen mit Umlauflüftung und Wärmeaustausch ein und betont die Wichtigkeit des Leistungsausgleichs in diesem Zusammenhang; 15-20%-ige Spannungsabfälle sind zulässig bei Frachtschiffen und Tankschiffen, 5-10%-ige bei Passagierschiffen. Selbstregelnde Wechselstromgeneratoren ohne fehlerbetätigte automatische Spannungsregler setzen sich gegenwärtig auf diesem Gebiete durch, da sie hervorragende Eigenschaften in bezug auf Leistungsausgleich und kurzfristige Ueberlastungsfähigkeit aufweisen.

Die Zuverlässigkeit handelsüblicher elektronischer Geräte 855
Auf einer gegenwärtig in London tagender Zusammenkunft elektronischer Fachleute stehen als Thema die Zuverlässigkeitswerte heutiger elektronischer Geräte zur Diskussion. Im grossen Ganzen herrscht Einstimmigkeit unter den Mainungen darüber, dass die Mehrzahl der heute hergestellten Elektronenröhren eine zufriedenstellende Zuverlässigkeit und Lebensdauer aufweist, während andererseits die Zuverlässigkeit anderer Teilgeräte wie Kondensatoren, Widerstände u.s.w. zu wünschen übrig lässt. Es wurde missbilligend hervorgehoben, dass die Hersteller von Halbeiterelementen z. B. sich anscheinend weigern, über die Zuverlässigkeit ihrer Produkte bindende Angaben zu machen.

Beirichte auf dem Gebiet der physikalischen Forschung 857
Neuere Mitteilungen des "National Physical Labaratory" befassen sich mit der Aufstellung einer neuem Norm für hochohmige Widerstände, neuen Untersuchungen über Kriechfunken bei feuchten Freileitungsisolatoren und Vorarbeiten zur Verwirklichung einer mechanischen Uebertragung aus der russischen in die englische Sprache.



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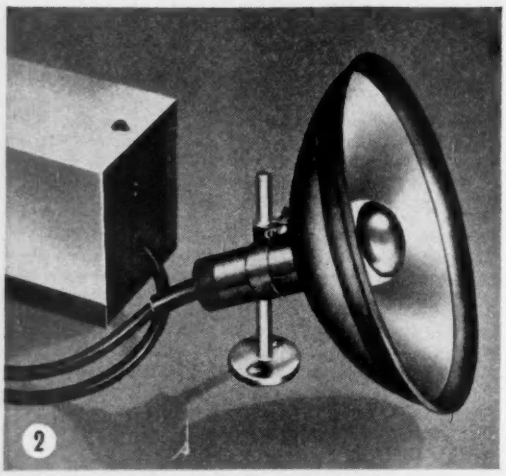

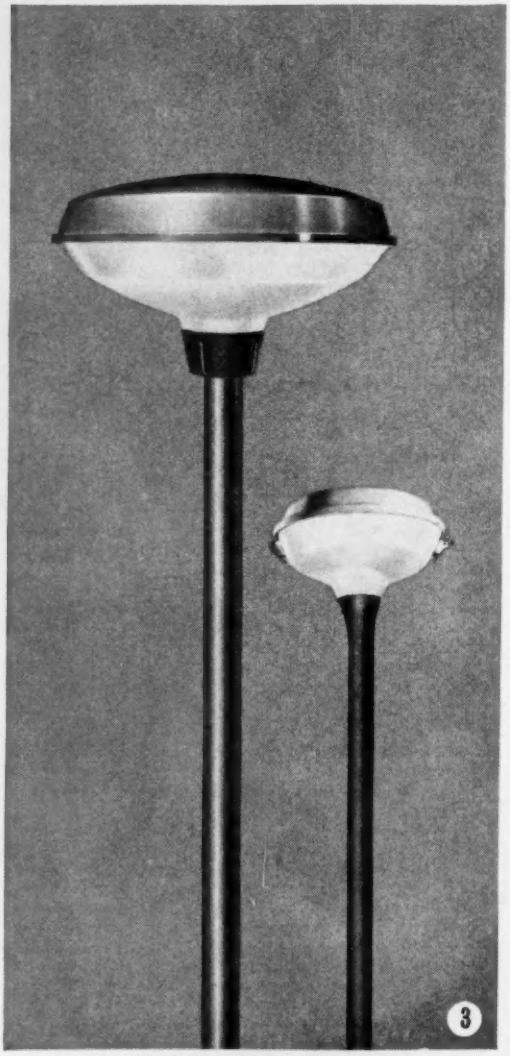

COUNCIL OF INDUSTRIAL DESIGN 1960 DESIGN AWARDS FOR ATLAS LIGHTING LIMITED

All the lighting fittings which this year won Design Centre Awards from the Council of Industrial Design are Atlas products. In addition Atlas Lighting Limited now becomes the first company to win three of these coveted awards in the same year.

This highlights the success of the Atlas design policy, which first gained 'official' recognition when the Atlas 'Kitchenlight' won similar distinction.

1 *'Chelsea' handwrought glass lighting fitting G.3 and J Y Glasses.*

2 *Low Voltage Display Lighting fitting DB.0050 with Transformer TR2338.*

3 *Street Lighting Lanterns and Columns. Models Gamma 4 and Gamma 5.*

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 26 MAY, 1960

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Comment

HORIZON AT BOURNEMOUTH

This year the BEPC is set the theme "The New Horizon" in electricity, but *sans* exhibition and with one day shorter, the convention has clearly been considering its own horizon. The most manifest change will be the absence of an exhibition, which provided such an excellent meeting place (albeit a costly one) for those delegates with time to spare. It is unfortunate that no central forum of this type will be available, not that there will be much time to make use of it with the more compact programme and higher rate of cocktail parties per hour. A new look also is noticeable in the papers to be read at the convention. Any ambiguity of purpose is removed by the council's specific statement that they are looking for publicity and prestige for the industry. With the good set of papers, results must attend on events. Horizons, however, lie in the distance and the way ahead is not yet fully defined. It has always seemed a doubtful policy to continue the IMEA practice of giving power and responsibility to presidents, rightly chosen for their status within the industry, rather than for their apprenticeship round the council table. For business meetings of the council, the election of a chairman could offer a greater degree of continuing responsibility while making less demands on busy presidents. However, the prospective president for next year, Sir John Pickles, is qualified on both counts. In his hands much could be done to set a firmer horizon to the convention.

LOCAL AUTHORITY'S HOUSING OPINIONS

The inquiry into housing standards for the future being carried out by the Ministry of Housing's Central Housing Advisory Committee has a scope wider than local authority housing; but it is in this sector that any recommendations it makes are likely to be most noticeable in their effect. This lends importance to the evidence that has been submitted to the committee by the Association of Municipal Corporations, representing the boroughs in England and Wales. This document shows a pleasing realism concerning the importance of electricity in everyday living. A refrigerator is considered "essential," and heating by electricity is "undoubtedly the method of the future" (though cost is attacked as decidedly high). In planning the kitchen, space should be left for the largest electric cooker appropriate to the number in family for which the house is planned, and there should be socket-outlets and space for an electric washing machine. All this is welcome, and so is the fact that the evidence confines itself to recommending provision of "adequate power points at the time of construction," rather than attempting to lay down some restrictive

Next week's issue of the ELECTRICAL TIMES will be the special convention number, with photographs and reports of the proceedings at Bournemouth

total. But there are criticisms also that the industry will do well to consider. Vibration from electrical appliances is alleged to worry flat dwellers and there is a somewhat obscure criticism that British Standards for power and lighting points are not sufficiently detailed or explicit; apparently an attack on troubles with interchangeability even with the 13 amp plug. A point to note about this evidence is that although it is specifically related to the future, there is nothing in it which is not applicable to present practice by local housing authorities, except in so far as they may be hampered by out-of-date recommendations from authorising the necessary expenditure.

ACCENT ON LARGE DOMESTIC LOADS

Manweb is to cut its domestic tariff. The reduction is only marginal, but behind it is something of the blend of sociology and commercial acumen that goes to build up the philosophy of electricity tariff-making. It is essentially promotional in character, aimed at the large domestic consumer by setting a large second block of units at the existing price of 1·05d, with a new final unit charge of 0·95d. At the same time, an off-peak tariff is being introduced at 0·9d, but clearly the board visualise this as having limited application in the domestic sphere. These changes align with the views we expressed some two months ago questioning the reality of offering off-peak domestic tariffs with marginal price differences, which, except for the largest consumptions, would not cover the extra costs occasioned by off-peak usage. The Manweb way out may not offer the bait of full off-peak price reductions; instead, they ask a somewhat higher price per unit to cover the gamble they are taking on peak incidence of the additional loads. The consumer is offered the incentive without any complication of wiring and the change to the new tariff could not be smoother. While this three-block pricing breaks no new ground in its basic form, it offers some new thinking about catering for the rising levels of consumer loads. With the present prosperous year for the industry, the move is one which some other area boards could take to heart.

ELECTRONICS RELIABILITY

Industrial electronic equipment has long outgrown the reputation for extreme sensitiveness and unpredictable reliability that once restricted its application; but it remains in general at a lower level of availability than electro-magnetic gear. So there was plenty to interest the electrical plant engineer in last week's IEE symposium on electronic equipment reliability, even though the main concern was with telecommunications, guided weapons and computer equipment. Amongst many points of detail which may save a lot of head-scratching when unexpected troubles occur is a warning by one author of the need to be constantly on the watch for accidental damage while servicing equipment containing transistors or semiconductor diodes. A momentary short-circuit of two tags or wires connected to a semiconductor unit may produce irreparable damage, due to the sensitivity of these devices to over-voltages; and worse still, the damage may not be clearly identified at once but may grow to the point of equipment failure only after some time in normal service. A similar slip with a valve would, generally speaking, produce no trouble; this voltage tenderness is a counterpart of the mechanical toughness of the transistor compared with thermionic devices. Emphasis on points like this was a continuing feature of this most worth-while symposium, which throughout maintained close connection with the realities of day-to-day operation, even to the extent of recognising that differences of opinion between operating and maintenance staffs is a reckonable factor in outage statistics.

QUICK CHECK ON CABLE SOILS

If a buried cable is to be used to its full capacity the installation engineer needs to know not only the nominal rating, but also the thermal characteristics of the soil in which it is embedded. Only then will he know the current that can be carried without danger of exceeding permitted insulation temperatures. The difficulty is to determine the soil characteristics. Various test methods are available, but they are relatively involved and may sometimes require lengthy experimental procedures, justified for a major high voltage cable but unlikely to be used for less important installations. A research project of importance now going forward is concerned with finding a simple correlation between soil classification and thermal resistance, so that a few spadefuls of soil taken along the proposed cable route will give the cable engineer the information he requires for what is at best an approximation. The first step in such a plan is to draw up the classification and this has now been done by the ERA. The instructions we note elsewhere in this issue and it can be seen that they meet all the requirements of simplicity that anyone could reasonably seek, being based on a look-feel-squeeze-pinch routine that results in a one-in-twelve identification which is found in practice to be highly reproducible. Engineers will now await eagerly progress with the other, and more uncertain, limb of the investigation, the check whether each of these soil types have some firm association with a specific level of thermal conductivity.

Meteor

This week's quick summary of electrical news faces advertisement page 24.

Shipboard a.c. generators

POWER SUPPLY FOR MARINE AUXILIARIES

by J. Griffin, A.M.I.E.E.*

IN discussing the principles and practice of shipboard a.c. generation it is necessary to consider only the synchronous type of alternator, although other and more special kinds of machine may well be required, usually in only quite small sizes, for such special purposes as the provision of power for communication and radar equipment. In the synchronous alternator relative motion occurs between a field or exciting system and an armature or output system, and there is a fixed relationship between the number of poles, the speed of rotation, and the generated frequency. All normal marine alternators are three-phase machines, the general adoption of the three-phase system being due to its greater distribution efficiency and economy for a given voltage, and to the superiority of polyphase over single-phase induction motors. Insulated and isolated neutrals, and thus three-wire distribution systems, are usual in British practice, and such single-phase loads as cooking, heating, and lighting, are supplied line-to-line, either directly or through transformers. Most British ships use a 60 c/s system, although in some Continental-owned vessels 50 c/s is preferred; the bulk of the 60 c/s generation is at 440 V, and the usual 50 c/s voltage is 380. It seems likely, however, that increases in the installed capacity in at least the larger passenger vessels will before long compel the use of a rather higher voltage (such as 3·3 kV) because of the non-availability of 440 V switchgear of sufficient breaking capacity.

Most marine alternators are rated at 0·8 power factor lagging, a practice hallowed by usage and tradition. It is often forgotten, however, that the alternator operates perforce at the system power factor; with a little more attention to the selection of the auxiliary motors, and bearing in mind the increasing importance of the often very large unity-power-factor lighting, heating and galley loads, many alternators could probably be rated at 0·85 lagging without serious risk and with consequent savings in first cost. It may also be doubted whether sufficient attention has so far been paid to the possibilities of motor power factor correction by means of individual static capacitors. By increasing the overall power factor to 0·9 or even 0·95 lagging, their use could considerably improve the running efficiency and voltage regulation of a normal installation, and their initial cost would probably be more than offset by the savings in the costs of the alternators and the cabling.

Alternator Types

There are two principal types of synchronous alternator, rotating-armature and rotating-field; these may be further sub-divided, according to the kind of field winding employed, into salient-pole and distributed-field machines. The salient-pole alternator has concentrated field coils and a markedly non-uniform air-gap, with only a single exciting coil on each polar projection; the distributed-field machine has a uniform air-gap, with an exciting winding distributed into slots in the stator or rotor core. Certain small or otherwise special two-pole (i.e. 3,000 or 3,600 r.p.m.) alternators may be of the distributed-field construction, and this is also used by the manufacturers of certain types of self-regulating alternators to assist in the provision of a particularly rapid voltage response. In general, however, most normal marine alternators are of salient-pole construction.

Rotating-armature alternators possess certain advantages over their rotating-field counterparts in the output and speed ranges for which they are particularly suitable. Owing, however, to the inherent necessity for the output current to be handled by the sliprings and brushgear, their output range is limited, and they are seldom employed for outputs of more than about 150 kW or at speeds of less than 1,000 r.p.m. Their usefulness afloat is thus severely restricted, and they appear principally in certain relatively small vessels or as emergency sets, although one application of some importance is their use in d.c.-equipped ships for the provision of an a.c. supply for fluorescent lighting.

The vast majority of marine alternators are of the salient-pole rotating-field type, and in both design and construction they follow the well-established principles and

* Mr Griffin is with W. H. Allen Sons and Co. Ltd. The article is based on a lecture which was one of a series on a.c auxiliaries for ships, delivered at the Royal College of Science and Technology, Glasgow.

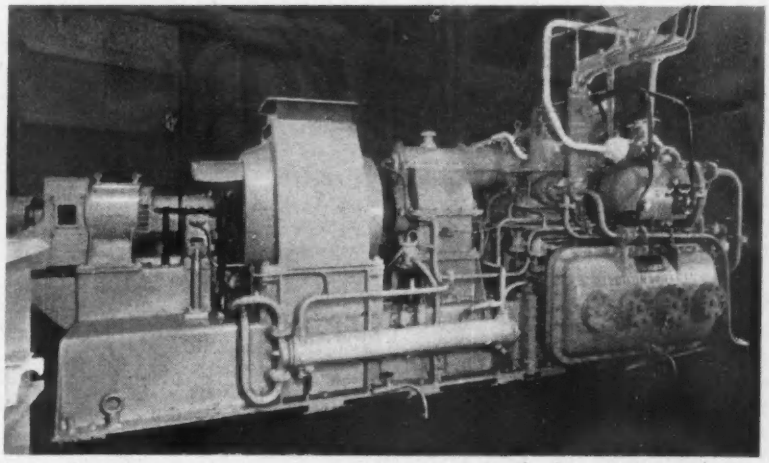


Fig. 1. Typical marine turbo-alternator, with main and pilot exciters. (This 440 V, 3 ph, 60 c/s, 1,800 r.p.m., 600 kW, 750 kVA machine is installed in the 32,000 ton BP tanker "British Justice")

practices normally employed for the manufacture of similar machines for use ashore. In view, however, of the special circumstances obtaining aboard ships, and especially because of the importance attached to reliability and the difficulty often experienced in providing a satisfactory standard of maintenance, the most careful attention is naturally paid to those aspects of the electrical and mechanical design having the greatest influence on the inherent reliability. Owing also to the greater importance attached in marine practice to the question of transient voltage performance, it is necessary too, on the purely electrical side, to consider rather more carefully the design of the exciting and regulating system.

As in land practice, there are two principal types of salient-pole rotating-field machine, which for want of an equally convenient but more accurate classification may be designated as "high-speed" and "low-speed." There is no difference in principle between the two types; there are, however, some significant constructional distinctions attributable mainly to the differences in speed.

"High-speed" machines are almost invariably employed as main generators, and they are usually of four-pole construction and driven by steam turbines; their outputs are normally in the 300 to 1,500 kW range. Their rotor windings, because of the stresses set up by the high rotational speeds and the relatively low number of poles, are usually of the single-layer strip-on-edge type; the exciting current is thus inherently relatively high, and the excitation voltage correspondingly low, typical currents being in the range 100 to 250 A at voltages of 15 to 40.

Laminated poles are sometimes employed, but this construction may be unnecessarily expensive, and solid poles and pole-tips (with the tips secured by means of screws) are more often used. The stator windings are similar to those of induction motors, although the slots are usually of the fully open type; two-layer lap windings of the bar or barrel type are usual, and anchored bracing rings may be used to help absorb the stresses developed in the substantial outhang in the event of a short circuit.

The "low-speed" machines cover a rather wider speed range, and since most alternators of this type are diesel-engine-driven the speeds tend to become lower as the outputs increase. The usual range of outputs is from 100 to 1,000 kW at speeds between 1,200 and 300 r.p.m.; a typical "stand-by" or harbour duty set might be of 150 to 250 kW at 600 r.p.m., but when machines of this "low-speed" type are used for the main alternators, outputs of 500 to 750 kW at speeds of 500 to 300 r.p.m. are more usual. The low-speed construction is characterised by the use of a multi-layer field winding of relatively small insulated rectangular strip on a laminated pole; the poles are normally secured to a cast or fabricated hub by means of screws or studs, and a pole-face damping winding is normally fitted to assist parallel operation.

Insulation and Temperature Rises

Only the two older classes of insulation, i.e. classes A and B, are recognised in the current Lloyd's Rules,* and the temperature rises permitted are generally (though not entirely, nor without some ambiguities) in line with those in the now superseded BS 168.† A 5°C reduction in the BS 168 rises is made to allow for the present Lloyd's "tropical" ambient of 45°C.

In the Lloyd's Register of Shipping Annual Report for 1959, however, it is stated that the electrical sections of the Rules are currently undergoing revision. It seems probable that in any such revision special attention will be paid to the necessarily related subjects of insulation, rating, and temperature rise, and some purely personal observations by the author on these very important matters will be found in an Appendix at the end of this article.

* Lloyd's Register of Shipping: Rules and Regulations for the Construction and Classification of Steel Ships, 1959: Chapter M, "Electrical Equipment."

† BS 168:1936 "Industrial Electric Motors and Generators."

Enclosure and Ventilation

Most marine alternators are of the ventilated drip-proof type, with radial ventilation; ventilating air is drawn in, from the engine room, at each end of the machine, and after passing radially outwards between the field coils, and through ducts in the stator core or over the stator outhang, is discharged at the centre of the machine, usually at the top. High-speed machines employ propeller-type axial fans, while for the lower-speed machines simple fan blades or scoops on the rotor usually suffice.

The ordinary ventilated machine has two principal disadvantages. Firstly, the use of the engine-room ambient air results inevitably in a deposit of oil and dirt on the machine windings; and, secondly, the whole of the machine losses are dissipated as heat into the engine-room atmosphere. The latter difficulty can be overcome, at some considerable structural inconvenience and expense, by ducting away the outlet air, though a separate extraction fan may sometimes be necessary to overcome the pressure loss in the ducting.

Both these disadvantages, however, can be eliminated by the adoption of closed-air-circuit water cooling, in which the same clean air circulates continuously through the alternator, being cooled between the machine outlet and inlet in an air/water heat-exchanger or cooler. Practically all the alternator losses are removed as heat in the cooling water, and since the machine interior remains clean and uncontaminated the useful life of the insulation is naturally prolonged. A further and incidental advantage of this type of enclosure is the marked reduction in noise level which invariably follows, especially with high-speed turbo-alternators. Emergency doors, blanking off the cooler and converting the alternator into a normally ventilated machine, are usually fitted for use in the event of cooler failure.

It is the author's personal opinion that this type of cooling will become increasingly popular, especially for turbo-alternators, and there are already signs that discriminating owners regard as a satisfactory investment the small additional cost of machines so equipped.

Internal Heaters

Internal heaters, designed to maintain the temperature of the machine interior slightly above that of the ambient air, and thus to prevent the condensation of moisture on the windings, are now often fitted. Such heaters are normally of the low-surface-temperature strip or panel type, and are usually supplied from the ship's low-voltage system at 115 V or 230 V. Special interlocking is often resorted to to prevent the energising of the heaters while the alternator is in operation; it is doubtful, however, whether anything more elaborate than a warning light is justifiable, since simultaneous operation of both alternator and heater would in practice have no significant effect on the winding temperatures.

Exciters

In conventional alternators the direct exciting current necessary for the field winding is invariably provided by a separate d.c. generator, usually directly coupled but some-

times (and especially with low-speed diesel alternators) belt driven.* Larger sets, and especially main turbo-alternators, sometimes employ small permanent-magnet a.c. pilot exciters, whose rectified output feeds the main exciter field via the a.v.r. (*automatic voltage regulator*); where, however, the a.v.r. is of the static magnetic amplifier type the pilot exciter is usually required to provide high frequency alternating current. Such separate excitation from a substantially constant-voltage source has several advantages; by eliminating the stability problem associated with the self-excited machine it facilitates the provision of any desired voltage "ceiling," and because also the full pilot exciter output is instantly available for exciter "field forcing" a superior alternator transient voltage response is obtainable.

Brushless Alternators

The elimination of the exciter commutator and the alternator sliprings has obvious advantages in respect of reduced maintenance and increased reliability, and to this end several British manufacturers have recently developed brushless alternators. Most of these are so far relatively small, but at least one manufacturer is offering turbo-alternators of up to 1,750 kW.

Such machines are not in themselves new, and their basic principle has been appreciated for many years; it is only recently, however, that the advent of the silicon rectifier has made them commercially practicable. The brushless machine (see Fig. 2) comprises a conventional rotating-field alternator, a polyphase a.c. rotating-armature exciter, and a set of rectifiers mounted on, and rotating with, the common alternator/exciter shaft. The a.c. output from the exciter armature is fed to the a.c. terminals of the shaft-mounted rectifiers, whose d.c. output is in turn fed to the alternator field winding, no commutator or sliprings being thus required. Power for the exciter field is normally obtained by "self-excitation" (through a rectifier) from the alternator output terminals, the residual magnetism of both exciter and alternator being available for excitation initiation. Some form of a.v.r. is essential, and the static magnetic amplifier type is an obvious choice, although circuits analogous (on a much smaller scale) to those used by the compounded alternators to be considered later may also be employed.

Synchronising and Parallel Operation

Alternator synchronising is neither difficult nor complicated; all that is required is approximate voltage equality and reasonably close speed matching. The circuit-breaker of the incoming alternator is closed at or about the instant at which the busbar voltage and that of the incoming machine are in phase, the selection being normally made with the aid of a synchroscope. Remote switchboard control of alternator voltage and prime mover speed are, of course, essential, but it is immaterial whether the incoming machine is brought in under a.v.r. or under hand control.

In parallel operation the real power is shared between the various machines by prime mover governor control; stable operation requires a speed droop with increasing load, and for proportionate load sharing the various speed/load characteristics must be matched. Similarly the reactive power is shared by means of excitation control; stable operation requires a voltage droop with increasing kVAr, and for proportionate reactive load sharing the various voltage/kVAr characteristics must be matched. With a conventional alternator an a.v.r. is invariably fitted, and the provision of the required voltage/kVAr droop is normally the responsibility of an ancillary circuit in the voltage signal feed to the error detector circuit of the a.v.r. (Another article in this series will deal with a.v.r's for marine alternators.)

* A belt drive may be adopted either where it is necessary to keep the overall set length to an absolute minimum, or where it is desirable to increase the speed of the exciter to help produce a satisfactory voltage response.

Steady-state Voltage Control

In a normal alternator the steady-state exciting current required to maintain a constant terminal voltage varies (even at only one power factor) considerably more than that of a d.c. generator, and when the effect of a variable power factor is taken into account the required ratio of full-load to no-load exciting current is usually of the order of $2\frac{1}{2}:1$. Since also it is necessary to allow margins in both directions to facilitate the provision of a satisfactory transient voltage performance and to cater for variations in alternator field winding resistance with temperature, an overall exciting current range of some 4:1 is in practice required.

In a d.c. generator the relatively small excitation compensation necessary can be readily obtained by load-current compounding, but with an alternator simple compounding of this type is impracticable. Even the obvious strata-

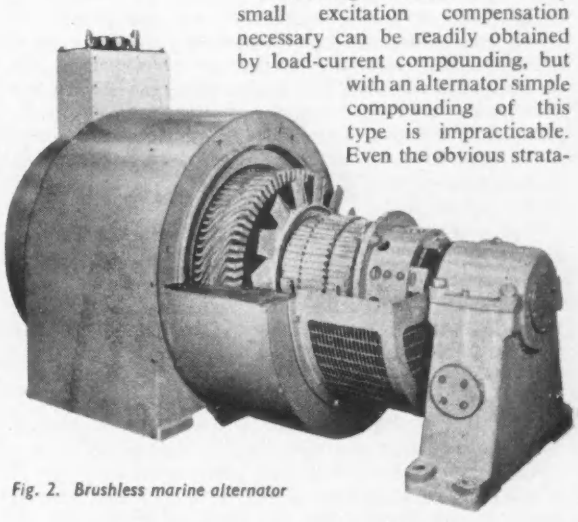


Fig. 2. Brushless marine alternator

gem of rectifying the output current and energising with it an additional "series" winding on the alternator rotor is neither very convenient structurally nor wholly adequate, since such an arrangement is inherently insensitive to load power factor.

In practice, therefore, an a.v.r. of some sort is absolutely essential. The direct control of the alternator field current would normally require a prohibitively expensive regulator, but the field current of the main exciter is very much smaller, and the various types of a.v.r. used with conventional alternators in ordinary commercial practice are invariably arranged to vary the main exciter field current automatically in response to changes in the alternator terminal voltage.

Transient Voltage Regulation

The steady-state accuracy of the usual types of marine a.v.r. is normally about $\pm$ 1 to $2\frac{1}{2}\%$ over the normal load, power factor, and speed ranges. Of at least equal importance, however, is the response of the alternator to *changes* of load, and the most important practical example is the effect on the alternator of the relatively large and low-

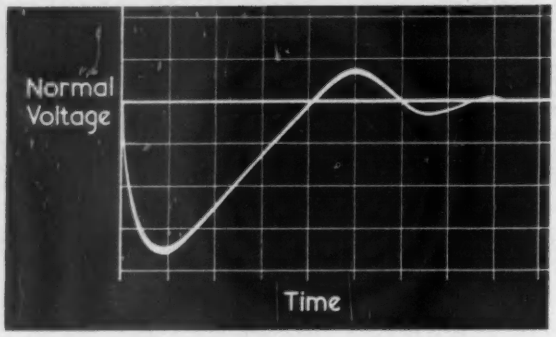


Fig. 3. Typical voltage response oscillogram for an alternator

power-factor loads imposed by the direct-on-line starting currents of squirrel-cage induction motors.

The transient voltage response to such a suddenly applied or "impact" load is of the general form shown in Fig. 3, from which it can be seen that the departure from normal voltage may be conveniently divided into two periods. Firstly, there is an initial and almost instantaneous dip merging into a rather slower descent to the minimum voltage; this minimum voltage is a function principally of the magnitude and power factor of the impact load, of the transient reactance of the alternator, and of the alternator time constants. Secondly, there is the relatively much slower recovery to approximately the normal voltage, usually with at least one overshoot before the establishment of the final stable condition; this recovery is a function of the alternator and exciter time constants, of the exciter ceiling voltage, and of the characteristics of the a.v.r.

Typical numerical values obtainable in practice from normal marine alternators and a.v.r's with a low-power-factor impact load of 50% might be as follows:

Maximum voltage dip: 10% to 20%, depending mainly on the size and speed of the alternator (and being less in a high-speed turbo-alternator than in a low-speed diesel-driven machine).

Recovery time (to within 2½% of normal voltage): 0·5 to 1·0 seconds, qualified as above, but dependent also on the design of the exciter and the type of a.v.r.

Final stability limit: 1 to 3 seconds.

The magnitude and power factor of any load already on the alternator have very little effect on the voltage dip, although the voltage recovery may be affected if the impact load constitutes a severe overload on the alternator and its exciting and regulating system. The relatively gradual load removal represented by the final acceleration of a starting motor may be expected to produce transient voltage increases of only about half the above values.

This question of transient voltage recovery is undoubtedly one of the most important factors affecting the performance of the installation as a whole, and although it seems sometimes to be attracting a rather exaggerated attention never considered necessary in earlier d.c. installations, serious thought ought certainly to be given to this matter before either the alternators or the motors are ordered. The maximum permissible dip will depend on the type of vessel, and on the frequency and method of operation of the offending auxiliary.

The type of vessel must obviously be taken into account; it is logical to permit rather greater momentary voltage dips in tankers or cargo ships than would be considered suitable in a passenger vessel, although even here quite large dips may well be allowed during the "starting-up" period before the passengers are aboard. The frequency with which a given motor requires starting is also important, since a momentary dip at only long and infrequent intervals naturally causes less disturbance and annoyance than one repeated frequently and regularly.

In tankers and cargo vessels voltage dips of 15% to 20% are commonly found acceptable; in passenger ships, however, a rather lower range of 5% to 10% is perhaps rather more usual, although the whole question is often very much a matter of the personal preference of the responsible engineer. It is perhaps worth noting that much greater voltage dips than these are technically acceptable,* and even a conventional alternator is normally quite capable of recovering from a voltage of only 50% to 60% of normal.

Self-regulating Alternators

As has already been suggested, it is possible that rather too much attention is being paid to the question of transient voltage regulation, but there can nevertheless be little doubt that the fullest realisation of the practical advantages of a.c. has been to some extent retarded by the evident need to consider the voltage variations likely to be caused by induction motor starting currents. The problem is naturally particularly serious where the motors are relatively large or where variations must be kept to an absolute minimum, and it is obviously no coincidence that tankers were the first to go over completely to alternating current; generally speaking, tankers have no very large motors and no winches, so that as a class they represent an obvious case for the enjoyment of the advantages of a.c. without being particularly vulnerable to its disadvantages. Passenger ships are only now abandoning the earlier d.c. system, and in this country at least the all-a.c. cargo vessel is still a rarity. With this latter type the heavy demands of the winch motors are the principal difficulty, and although new types of a.c. winch are no doubt in prospect, there has for some time been a demand for an alternator with superior voltage response characteristics and thus better able than the conventional alternator to cope with relatively large motor-starting loads.

It is to satisfy this demand that various types of so-called "self-regulating" alternators have been developed. Unfortunately there is no generally accepted or wholly satisfactory definition of a "self-regulating" alternator, but the term is perhaps definable adequately enough as an alternator and excitation system which without the use of a separate error-actuated control provides an approximately constant output voltage over a satisfactory range of loads and power factors. In practice many of the alternators described by their manufacturers as "self-regulating" do in fact include an error-actuated control; where, however, the control is intrinsically part of the machine (as in, for example, the Macfarlane "Magnicon"), or where it is superimposed purely as a "trimmer" on to a functional or inherent type of control (as in several compounded alternators) the description "self-regulating"† is perhaps admissible.

A detailed description of the construction and principles of operation of even some of the self-regulating alternators currently available is beyond the scope of the

* Furthermore, and in spite of a widespread belief to the contrary, quite severe voltage dips have no significant effect on motor control gear.

† The term "self-regulating" should not be confused with "self-exciting." A self-excited alternator is one in which the excitation power is bled off the output or obtained from an additional armature winding, and although some of the available self-regulating alternators are in fact also self-exciting, this is by no means essential for their principal purpose.

present survey but will shortly be presented in a separate article. It is possible here only to note the features common to most of these technically very interesting machines, whose advantages over the conventional alternator include not only the superior transient voltage response performance which has been the principal reason for their development, but, also, a higher short-time overload capacity, and, often, completely static excitation equipment.

The methods used by the various manufacturers of marine self-regulating alternators naturally vary in detail, but the desired reduction in transient voltage dip is usually obtained by the direct addition to the alternator excitation of a component proportional to the load current. This direct injection of a "series" excitation component so modifies the inherent transient characteristics of an otherwise conventionally constructed alternator that the transient voltage dip for a given impact load is considerably reduced.

For the best results a "phase-compensated" system, in which the total excitation is varied in response not only to the magnitude of the load current but also to its power factor, seems a logical aim, and most manufacturers do employ "phase-compensated line-current-compounding" as the basis for their systems. The principle most often used entails the virtual duplication, in the excitation equipment, of the basic m.m.f. (*magneto-motive force*) relationships of the alternator; a substantially constant "shunt" component (corresponding roughly to the alternator "magnetising" m.m.f.) is combined vectorially with a "series" component (corresponding to the armature reaction m.m.f.) to produce inherently a field current approximating closely to that required for the maintenance of normal voltage.

The necessary combining process lends itself naturally to the use of such static components as transformers, reactors, and rectifiers, and most of the available machines do employ completely static excitation and control systems. The substitution of a static system for the conventional rotating d.c. exciter results in increased reliability and greatly reduced maintenance, principally because of the elimination of the exciter commutator and brushgear. The excitation equipment may require accommodation in a separate cubicle, or it may (in suitable circumstances) be incorporated in the main alternator switchboard. In any event increased layout flexibility invariably follows, since the overall length of the alternator set is naturally considerably reduced by the absence of the exciter.

Acknowledgments

The author is indebted to AEI (Rugby) Ltd. for the provision of Fig. 2, and to the directors of Messrs W. H. Allen Sons and Co. Ltd. for the provision of Fig. 1 and for permission to publish this article; the opinions expressed in the article are, however, entirely the author's own, and they do not necessarily reflect wholly or partly those of the organisation with which he is connected.

APPENDIX: INSULATION, RATING AND TEMPERATURE RISES

AS has already been mentioned, the electrical sections of Lloyd's Rules are currently undergoing revision, and the following observations on some of the possible changes are prompted mainly by the author's belief that some of the temperature rises permitted by the current BS 2949* are not altogether in the best interests of the user.

Regarding insulation it seems probable that any new edition of the Rules will permit in the future greater freedom in the use, in appropriate circumstances, of some of the newer types of insulation. A particular and obvious example is provided by the materials forming a class intermediate between the familiar Classes A and B; such materials are designated in BS 2757† as Class E, and their almost universal acceptance in industrial practice probably renders their ultimate entry into the marine field a foregone conclusion, especially as they are already recognised in the recent and completely new BS 2949.

Regarding rating, and again in view of the recent appearance of BS 2949, it seems likely also that in the new edition of the Rules the long-established "load-plus-overload" rating will give way to the more modern "continuous maximum rating" philosophy. The case for the adoption of the continuous maximum rating is perhaps less overwhelming in respect of generators than with motors, where the load-plus-overload rating pass has in any case been sold in effect long since by the Lloyd's acceptance of totally-enclosed machines having continuous maximum ratings and higher temperature rises. Since, however, the sustained overload capacity of the present-day alternators seems in practice to be seldom utilised, and since in any case the prime mover is not always capable of the same overload as the generator, the greater economy of the continuous maximum rating may perhaps be safely enjoyed.

In respect of temperature rises, however, there are grounds for believing that the ultimate position may be rather less satisfactory. Some of the ambiguities in the present Lloyd's Rules are perpetuated in BS 2949; moreover (and this does not seem to be generally appreciated even in manufacturing circles), some of the temperature rises tolerated in BS 2949 could lead, in practice, to total winding temperatures higher than those permitted even by BS 2613.*

To appreciate this important point more fully it is necessary to go into a little more detail. Table 1 lists the most important of the total winding temperatures permitted by BS 2613, together with the corresponding values allowed in BS 2949, and a study of this table will demonstrate the existence of a number of anomalies and ambiguities. The most serious discrepancy, however, is the absence from most of the BS 2949 figures of any additional margin for the real effect of the high operating ambient.

In most instances the difference between the temperature rises permitted by the two specifications is the simple

* BS 2949:1960. "Marine Motors and Generators."

† BS 2757:1956. "Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service."

* BS 2613:1957. "The Electrical Performance of Rotating Electrical Machinery."

Table 1. Maximum Permissible Winding Temperatures of A.C. Machines (in °C)

Type of Winding	B.S.	Method*	Class of Insulation			Enclosure
			A	E	B	
Low tension stator and rotor windings (except those below)	2613	T	95	105	115	Any
	2949	T	90	100	110	Ventilated
	2949	T	95	105	115	T.E.
Salient-pole field windings						
(a) Single-layer with exposed bare surface	2613	R	105	120	130	Any
	2949	T or R†	105	120	130	Any
(b) All others	2613	R	100	115	125	Any
	2949	T†	90	100	110	Ventilated
	2949	T†	95	105	115	T.E.
	2949	R†	100	110	120	Ventilated
	2949	R†	100	115	125	T.E.

* T: measurement by thermometer; R: measurement by "increase of resistance." † No indication is given as to at whose option, or in what circumstances, which method is to be used. (It should be noted that the normal maximum cooling air temperatures permitted by BS 2613 and BS 2949 are 40°C and 50°C respectively.)

difference of 10°C between the two maximum ambients. But in practice the temperature rise of a given machine operating at a given load increases somewhat as the ambient temperature increases; if therefore the only allowance made for a higher ambient is a reduction by the simple difference between the two ambients, then there is a real danger that the total temperature actually reached in the higher ambient may exceed the intended maximum.

Most marine alternators are tested in this country in ambients of 15 to 25°C, and a machine exhibiting the maximum permissible temperature rise in such a low ambient would probably exceed this rise by some 5 to 10°C in an ambient as high as 50°C. That this is so is in effect recognised in the latest edition of BS 2613, which now stipulates an additional correction where the difference between site and test ambients is more than 30°C. For a site ambient of 50°C, and a test ambient of, for example, 17°C, the permissible test rise to BS 2613 is reduced not merely by 10°C (the difference between the site ambient and the maximum permitted ambient of 40°C), but additionally by a percentage equal numerically to one-third of the difference between the site and test ambients, i.e., by $\frac{1}{3}(50-17)$ or 11%. Consider then the specific instance of a Class B salient-pole field winding of the bare strip-on-edge type, normally permitted by BS 2613 a temperature rise by resistance of 90°C; the permissible rise on test in an ambient of 17°C of a machine destined for a site ambient of 50°C would be $0{\cdot}89\{90-(50-40)\}$, or only 71°C. No similar additional allowance is required by BS 2949, and a machine exactly similar to the one in the above example would be permitted by BS 2949 a test temperature rise in the 17°C test ambient of $\{90-(50-40)\}$, i.e., of the full 80°C.

One further point. Most engineers with marine experience would probably agree that in a ship's engine room or generator compartment in tropical waters nothing is more likely than the continuance for long periods of an ambient temperature at or near the 50°C permitted by BS 2949. It is important to note, therefore, that the compilers of BS 2757, in considering the maximum temperatures to be assigned to the various classes of insulation, *specifically discounted as "improbable" the maintenance of the ambient temperature at its maximum value for long periods of time.*

It is in the interests of all concerned that the deservedly high reputation for inherent reliability at present enjoyed by British-built generators should be jealously guarded and carefully maintained. It is to be hoped, therefore, that those responsible for the revision of the present Lloyd's Rules will consider the whole position very carefully before adopting modifications which could lead to winding temperatures higher than those envisaged even in BS 2613.

Marketing Organic-moderated Reactors

ENGLISH ELECTRIC have an agreement with the US concern, Atomics International, for co-operation in the design of organic liquid moderated and cooled nuclear reactors. Last week the leading US expert in this field, Dr C. Starr, spoke in London of the present state of technology of this type of reactor (OMR). The OMR uses a carbon-hydrogen compound to cool and moderate the core of the nuclear reactor, which is powered by enriched uranium. The liquid currently in use is terphenyl. This circulates in the reactor core and then to heat exchangers, where it raises steam from water. The steam is used to power turbines. Advantages of terphenyl are that it is reasonably stable under radiation and high temperature, is relatively cheap, and can be used without pressurisation in the reactor system, and below its vaporisation point. The advantages claimed for the OMR are that it can be built using normal carbon steels, with flanged joints on pipe work, and access for maintenance purposes is possible to most components without extreme nuclear hazards.

English Electric Interest

English Electric are interested in the OMR as a complement to the gas-cooled graphite-moderated reactor. The immediate concern with OMR is for ship propulsion, but reactors of this type are also thought to be promising for relatively small power stations. At present, Atomics International is co-operating with English Electric in the preparation of tenders for the Ministry of Transport proposed nuclear power tanker. The two companies have submitted joint preliminary tenders for a nuclear power station in Portugal, and English Electric are assisting Atomics International in the design and layout of turbo-generating and electrical equipment for a project in Spain for which the reactor is to be developed by Atomics International. Some facilities at the Whetstone establishment of English Electric are being used by Atomics International in connection with nuclear design. Dr Starr made it clear that Atomics International had no immediate intention of using English Electric information to enter the gas-cooled graphite moderated reactor field.

In America, plans are being made to extend experimental facilities for development the fuel elements to be used for OMR. Atomics International has successfully adapted aluminium oxide-aluminium alloys for use as cladding material for such fuel elements, and these are thought to have many advantages.

A high degree of safety is claimed for the OMR, partly because a leak in the organic liquid circuit will not cause vaporisation of the liquid. Dr Starr pointed out that the prototype 11·4 MW output nuclear power station being built at the City of Piqua in the USA, is only 700 ft distant from a main road and a rather heavily developed residential area. He claimed that this was the closest approach for a nuclear power station that had been permitted in the US.

In terms of economics, the main advantages of the OMR are its low capital cost, at least so far as the reactor and associated equipment are concerned, and the likelihood that maintenance and operating costs will be relatively low. On the other hand, the coolant material is not cheap, and a proportion of it has to be bled off continuously for processing, to remove some of the products of radiation damage.

Experience is needed to determine what value is to be placed on the undoubted simplicity of construction possible with the OMR system. Mr E. M. Price, general manager of English Electric's atomic power division, has suggested that the simplicity and comparative safety will appeal to countries which will have difficulty in assembling large teams of highly-trained technicians needed for operation of some other reactor systems.

Attention is being given to the possibility of using an organic liquid coolant in connection with heavy water moderation for a nuclear reactor.

So far as ship propulsion is concerned, English Electric studies have led to the conclusion that it is one of the two most promising systems for a marine nuclear propulsion unit, and that it is by far the simplest and safest.

A.E.I. laboratories at Harlow

NEW RESEARCH FACILITIES

WHEN the chairman of AEI, Lord Chandos, officially inaugurated the new laboratories at Harlow last week ("News of the Week," page 828) important new research facilities were made available to the company's Woolwich group. This incorporates the late cable interests of Henleys, Liverpool Electric and Siemens, Edison Swan, the radio and electronic components and telecommunication interests of Siemens, Edison Swan and the production activities of other subsidiaries, such as AEI Plastics (Aldridge) Ltd., Henley's Foundries Ltd., the London Electric Wire Co. and Smith's Ltd., etc., which still retain their separate names.

The scale of research interests, therefore, covers a wide field which, for administrative reasons, has been divided into nine sections. Two of these, dealing with telecommunications, are housed at Blackheath, though administered from Harlow.

The Research Sections

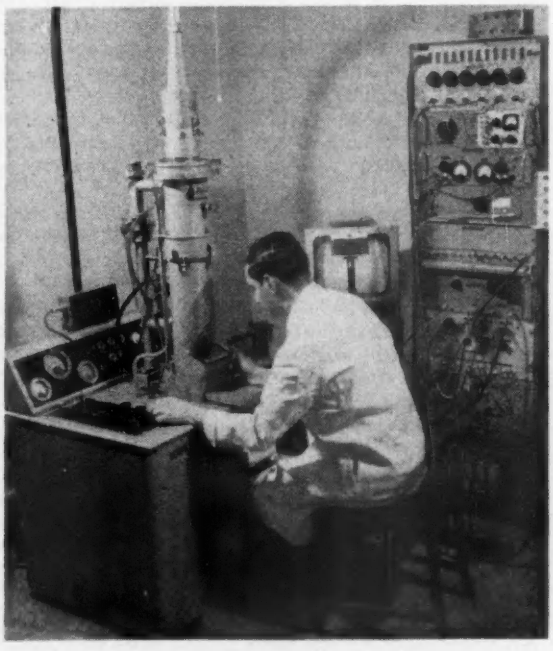
The first section is concerned with the development and application of luminescent and photoconducting materials. This involves the pilot production of phosphors and the relation between their luminescent properties and granule size, effect of impurities, activators, etc., and also a study of the preparation and optical/electrical properties of photoconducting compounds. Cadmium sulphide is, at present, the main subject of investigation and has been applied to the intracavitary measurement of gamma ray doses in the human body and other forms of radiation measurement. The second section is investigating the design, performance and stability of transistors. Reproducibility in production is one of many aspects which is of prime importance to both user and manufacturer; the development of production techniques for manufacturing some of the later types of transistor with connections and electrodes of microscopic proportions is another aspect engaging the attention of the design group. The equipment includes apparatus for growing or pulling semiconductor crystals, zone refining and the preparation of the transistor elements under conditions of controlled cleanliness. Similar investigations into ferro-magnetic materials are the responsibility of scientists in the third section and, in a fourth, the vacuum physics group are actively engaged on the study of determining leaks as small as 10^{-9} micron-litres/second in valves and cathode ray tubes. An associated study is the identification of small gas traces in evacuated appliances by mass spectrometry.

Lord Chandos, chairman of AEI, operating the table transmitter which unveiled the commemorative tablet

Electron optics and the development of image tubes is the concern of the fifth section which has also developed, in the space of 18 months, an electron image intensifier giving magnifications of the order of ×1,000,000 when applied to a conventional electron microscope and, moreover, the image is presented on a television screen where it can be viewed simultaneously by a number of persons. This has been made possible by an ingenious application of the property of cathodo-conductivity possessed by amorphous selenium.

Three other sections, metallurgy, chemistry and materials, are largely co-operational in providing all with specialised knowledge to the solution of metallurgical and chemical aspects of problems as they arise and in the production of experimental appliances in wood, plastics, metal and glass. The glass-blowing laboratories, in particular, are exceptionally well equipped and staffed to produce, at short notice, the most complex devices required for experimental or pre-production use. Cable research and the use of both rubber and plastics insulating materials is a particular interest of the chemistry section. The last two sections, at Blackheath, are now studying the applications of transistors to multi-channel telephone working and the fields of application of *pnpn* transistors.

Apart from internal interests, the laboratories are also engaged upon other research, projects including a light intensifier tube for the Mt Palomar 200 in. reflecting telescope. The director in charge of the laboratories is Dr M. E. Haine, D.SC., M.I.E.E., F.INST.P.



The EM6 electron microscope with the optical image intensifier (under the desk by the operator's knee) which enables images with a magnification of 10^6 to be seen on the TV screen in the background

I.E.E. maintains membership growth

34% INCREASE IN STUDENT MEMBERSHIP

A HEARTENING increase of 34% in the number of student members elected during the year and an overall increase in membership of 1,678, the second highest figure obtaining during the last 12 years, was one of the points emphasised by the president, Sir Willis Jackson, when he presented the IEE annual report to the annual general meeting last week.

Total membership is now 46,222, of which 53% are corporate members, compared with 47% in 1950. Although the number of corporate members has risen, the council expressed some concern that fewer members are transferring from the associate member to member class. During the year the membership committee considered 5,589 proposals, of which 2,708 were accepted. Of these, 560 candidates were interviewed for election or transfer.

A feature of the year's activities which aroused considerable feeling among a section of members was the proposal to increase both entrance fees and annual subscriptions. In all, three special general meetings were called to resolve this issue. The subscription increase was finally agreed by a poll of 4,701 votes to 736. As a result of some criticisms expressed at these meetings, the council decided to set up an *ad hoc* committee to make recommendations for improving channels of communication between council and the membership. The advisory committee consists of 14 members, of whom nine have served or are serving on council, and it is under the chairmanship of Mr O. W. Humphreys. So far, more than ten day-long meetings have been held, covering nearly every phase of the institution's activities. Good progress is reported and it is hoped that recommendations will shortly be made to council.

Activities

An extremely successful function held during the year was the international convention on transistors and semiconductor devices held in May, last. Of more than 2,000 participants in the convention, 400 came from overseas, and attendance at the concurrent exhibition was 33,500.

Following the success of last year's convention, this year's plans include a conference on Electronic Engineering Components and the Medical Electronics Conference which, it is felt, will be of particular importance.

Meetings held during the year exceeded 500, the bulk being meetings at local centres and numbering about 280. In general, the specialised sections accept about half the papers submitted for reading at meetings and by far the largest number, 182 papers, was submitted to the electronics section, although it should be borne in mind that 68 of these related to the transistor convention. Welcome news for the local centres is that in future, speakers' travelling expenses will be met from the general funds rather than the local centre grants.

Among the technical investigations in progress are revision of nine codes of practice, including those for lighting in schools and streets, and drafting of codes on dust-tight enclosures and climate-proofing for electrical equipment. A draft of the fourth edition of the regulations for electricity in ships is now nearing completion.

Notable introduction during the year, from the point of view of the student undergoing training, was the training regulations. The aim of these regulations is to set out the order in which training should be followed. They will enable a candidate's training to be assessed at any time after qualifying for graduate membership, so enabling him to know how nearly he is approaching the requirements. During the year, most of the Higher National Diploma courses have been revised to conform to a common standard. Many colleges have also altered their National Certificate courses, both to allow earlier inclusion of electronics in the syllabus and also to enable the falling number of National Certificate candidates who are seeking institution membership by these courses to do so more easily.

The popularity of the institution's advisory service on education and training may be judged from the 5,000 letters received during the year asking for advice.

Building Progress

Reconstruction of the building has reached the stage where the library alterations are completed, with a suite of offices for the editorial department. Although unexpected difficulties have arisen during reconstruction, including unexpected failure of the lecture hall ceiling, it is hoped that the alterations, which include additions of side wings and a gallery, will be completed towards the end of the summer. Cost of the reconstruction is anticipated to be close to the estimated figure of £400,000.

This year the presentation of accounts has been modified to give a truer picture of the cost of many activities by allocating salaries and accommodation charges to departments.

Income during the year totalled £200,385, of which £189,830 was derived from subscriptions. Total expenditure amounted to £196,457, of which £101,224 was allocated to wages, salaries and national insurance.

Five conventions were held during 1959 and the effort to make them self-supporting was successful to the extent that they showed an excess of income over expenditure amounting to £317. Conventions are now regarded as an integral part of the institution's activities, and whenever possible they will be made self-supporting.

An apparently considerable increase in the cost of the *Journal and Proceedings*, giving a total cost of £92,288, is due in part to the allocation of charges for salaries and departmental rents. Actual publishing costs fell by over £6,000 to £15,443, while production costs fell by about £3,200, largely as a result of the printing strike. However, although receipts increased by nearly £3,000 it is expected that the 7½% increase in printing costs will be felt during the current year.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Unsatisfactory Wiring

THE recent remark by the Durham coroner that: "This was just one of those numerous cases where amateurs start messing about with electricity and cause fatal accidents," where a woman was killed by the faulty fitting of an electric socket is no doubt fully justified. Unfortunately, however, the professional electrician is frequently guilty of serious and dangerous wiring errors and, if my own experience is anything to go by, many families must be blissfully unaware as to the shortcomings of their house installation.

In moving into a new, speculative-built house in Scotland where the electrical work was sub-contracted out to a large firm of electrical contractors, the following faults were found:

(a) One end of the ring circuit was connected to the 30 amp ring circuit fuse and the other end to the 15 amp immersion heater circuit, the immersion heater being connected to the ring circuit fuse. This was discovered when I tried to isolate the ring circuit by removing the fuse, only to find that the circuit was still alive.

(b) The Paxolin guard had been left off the switch fuse unit and in removing a fuse I received a shock. In this connection it should be noted that the meter and fuses are on one side of a deep cupboard only 24 in. wide.

(c) All the upstairs lights were switched in the neutral. Apparently the wires left the fuse with the red as live and black as neutral but arrived upstairs reversed.

(d) Two of the upstairs lights would not work due to wrong connections.

(e) All lighting switches were fastened to conduit boxes connected to unearthed conduit. The switch fixing screws were metal and protruded from the switch. This was overcome by replacing by nylon screws.

The contractor was apologetic regarding the faults and speedily put all to rights, but it would seem that a much closer inspection of new house installations, as carried out by professionals, is necessary.

D. J. Legg, A.M.I.E.E.,
GLASGOW.

Protection for C.M.R. Motors

M MOGNELLE'S experience with thermostats for motor protection is interesting. One is left wondering, however, about the nature of the thermostat construction, for as I said in my letter of 24 March, although it is vital that the thermal conductivity between the motor winding and the sensitive elements of the thermostat should be high, in practice, it is low.

M Mognelle experiences difficulty with a stalling motor switched on from cold; what he is concerned with is certainly the fact that the winding temperature overshoots the thermostat setting. The oscillogram reproduced here (which should interest all motor designers and control gear engineers) shows the temperature by a thermocouple of negligible thermal capacity and time-constant buried in the winding overhang of a stalled motor. The motor supply is broken after 25 seconds but it is seen that the winding temperature continues to rise a further 41°C. The behaviour of a thermostat having a far greater thermal time-constant under the same conditions can well be imagined.

Mr Bingley described in his letter of 14 April a very advanced form of protection relay. Obviously a device which amongst other things detects actual temperature of the machine cooling air has great merit.

But even this relay cannot differentiate between the heating of an accelerating motor and a stalled motor because it cannot modify its performance to suit the stand-still losses and the rotor losses at varying degrees of slip at substantially the same primary current.

The writer wishes to acknowledge to his recent colleague Mr D. B. Brook (now with Watford Technical College) the technique used in obtaining the oscillogram. It will be appreciated that the stray fields present in a motor make it difficult to record the small temperature-related voltage in the thermocouple circuit.

R. A. F. Craven, A.M.I.E.E.,
DIRECTOR, WATFORD ELECTRIC AND MFG. CO. LTD.,
WATFORD, HERTS.

Switchgear Afloat

I AGREE with Mr Unwin that the "peak-making current" under asymmetrical conditions can be in excess of what I quoted but, as he says, my article was but a brief outline of those to follow, which deal in more detail with the sections I mentioned. I used asymmetrical conditions as easier to calculate and understand.

However, for fault levels under asymmetrical conditions of the magnitude mentioned by Mr Unwin, the fault itself would have to be:

(a) on the outgoing side of a feeder breaker on the main board.
(b) a dead short with no resistance.
(c) at one instant only of the cycle.

Even with conditions (a) and (b), the chances are that the fault current is more likely to be closer to the symmetrical than the asymmetrical. Also is (b) very likely? Again, if the fault is on the other side of a transformer in the circuit, there is a big drop in the fault level.

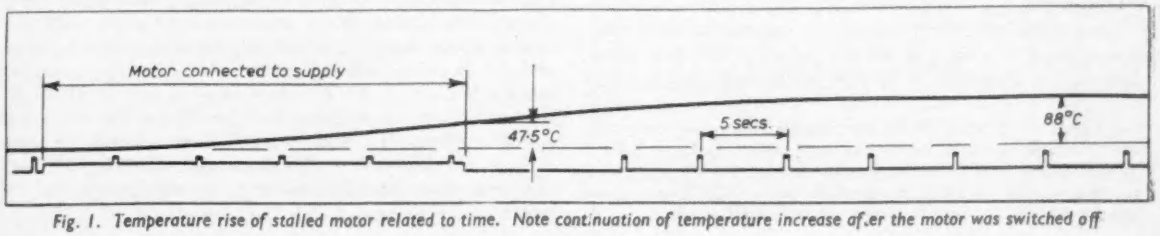


Fig. 1. Temperature rise of stalled motor related to time. Note continuation of temperature increase after the motor was switched off

Complete protection, I am afraid, is an unattainable ideal, and to cover all possibilities is impracticable. The short-circuit danger has been with us for the past 30 years or more with very few major accidents as far as I am aware, but I would be pleased to have the views of shipowners on this point.

H. B. Hughes, B.SC., M.I.E.E.,
GLASGOW, W.1.

Solderless Connections

WHILE the discussion on the above subject which has been carried on in your pages between Mr Hill and Dr Rowland is, no doubt, interesting to the metallurgist and the designer of compression fittings and equipment, I fear it has left me confused rather than enlightened!

I suggest that the ordinary transmission engineer is not greatly concerned whether cold welding takes place or not in such fittings. He is, however, as Mr Hill so rightly points out, greatly concerned with consistency of performance.

Two practicable aspects of this matter will be of considerable importance to him: (a) the treatment of the conductors prior to crimping, (b) the use or omission of inhibitors or jointing compounds.

I find myself far from clear whether Dr Rowland disagrees with Mr Hill's preference for omitting inhibitors or jointing compounds when making such connections.

Again, concerning the question of oxide films, I find Dr Rowland's remarks on page 492 of the 31 March ELECTRICAL TIMES (near the centre of the second column) somewhat obscure. He says: "If the rods are left to oxidise in air for several days, the difference becomes even greater." I am not clear what difference becomes greater than what; but the whole of the second paragraph seems to suggest that Dr Rowland advocates allowing contact surfaces to oxidise. I have difficulty in believing that I have correctly interpreted his views.

L. J. Archer,
WEST KIRBY, CHESHIRE.

More Ideas on Housing Standards

TWO more bodies have published their memoranda of evidence to the Ministry of Housing's investigatory committee into housing standards in the future.* They are the Association of Municipal Corporations, representing boroughs in England and Wales, and the Association of Electrical Housecraft Advisers.

The AMC have much to say to electrical manufacturers; and much by way of recommendations on housing standards that the electrical industry will welcome. For example, they call for sufficient space in the kitchen to facilitate use of the "largest gas or electric cooker" likely to be needed by the size of family for which the house is designed. They also suggest that there should be space for accommodating a refrigerator, which "may well be regarded as essential" today, but they do not agree with some commentators that this permits the exclusion of a ventilated larder.

Laundry Facilities

On the question of laundry facilities, the AMC feel that the amount of laundering carried out in the home is lessening, at least in large centres of population, due to development of the laundrette. They none-the-less call for provision to permit tenants to install washing machines—in the kitchen, not the bathroom. The Association thinks that the average kitchen provides adequate space for the amount of laundry now done in the home, but they remark that: "A point for an electric washer or boiler is needed in a suitable position near the water supply and drainage."

On heating, the AMC view is that willingness to pay for whole-house heating will increase over the next few years. Heating by electricity is thought undoubtedly the method of the future, but the criticism is advanced that the cost is "decidedly high except in the case of electric floor-heating." There is a call for installation of adequate numbers of power points at the time of construction of a house, but no indication as to what constitutes adequacy.

Electrical appliance manufacturers are called on to study the reduction of vibration in their products more closely, in the interests of flat dwellers. There is criticism as well, somewhat vaguely expressed, of BSI. This runs as follows:

The standards for power and lighting points laid down by BSI are not considered sufficiently detailed or explicit. Considerable danger arises through tenants' attempts to overcome the difficulties arising from variation in pattern.

Ladies' View

It is the ladies' view which is expressed by the Association of Electrical Housecraft Advisers. Unlike the AMC, they suggest a standard of socket-outlet provision; it is 6 to 10 s.o. for the living room; 4 to 6 s.o. for the bedroom (or, as the Association prefer, bed-sitting room); and provision for one or two permanent connections in the bathroom. If laundry work is done in the kitchen, 6 to 8 s.o. in addition to the provision on the cooker control unit; 2 to 3 s.o. in the utility room; 2 s.o. in the circulation space on each floor; 1 s.o. in the loft.

On laundry work there is support for provision in a utility room, but where this is not possible, the kitchen is strongly preferred to the bathroom. The Association speak out strongly on the need to think more about kitchens in terms not only of aggregate floor space, but also of planning, to permit accommodation and ready use of the many domestic appliances coming into use. It is thought that any buildings being erected today should be equipped to meet the growing demand for whole-house heating, and the usual good word for electric floor-warming appears. Centrally-heated homes should never be left without a refrigerator; and in general, an adequate size of refrigerator should be accepted as replacing a built-in larder.

* Terms of reference of the housing standards sub-committee are "to consider the standards of design and equipment applicable to family dwellings and other forms of residential accommodation, whether provided by public authorities or by private enterprise, and to make recommendations."

B.E.P.C. 1960

The Electrical Industry at Bournemouth Looks to the Future

RESTRICTED as it is to a four-day programme, and bereft of the familiar electrical exhibition, the British Electrical Power Convention for 1960 will be in some respects an organisation under trial when it gets under way at Bournemouth next week. However, most of the regular functions have been fitted into the truncated week, with the golf competition a notable victim. There is an after-lunch beginning to the convention proper, after the supply industry representatives have spent the Monday morning in private session. The table lists the official programme and notes some of the other functions of importance—functions which will be supplemented by a large number of private gatherings, at which much of the exchange of ideas so important to the health and purpose of the convention will take place.

1960 Theme

This year's president of the BEPC is Viscount Chandos, chairman of AEI, and the theme of the convention, traditionally at his choice, is the new horizon for the electrical industry. This theme is to be developed by only four authors, as the programme shows, but they are particularly well-suited to their tasks. Two of the authors speak in part by virtue of offices they have held; Mr Daniel at the time of writing his paper was chairman of EDA, and Mr E. V. Small was chairman of the export panel of BEAMA. The papers show that the distance of the horizon varies according to the standpoint of the observer, whether it be manufacturing, the supply industry generally, export, or the electrical developer closely concerned with domestic electrification.

Principal guest for the convention dinner, in many respects the highlight of the week's proceedings, is to be the Marquess of Salisbury, K.G., P.C., F.R.S. The dinner this year is being held in the ballroom of the Pavilion, the venue for nearly all the meetings during the week.

There has been no tampering with the well-tried programme for the last day of the convention; an "electrical forum" any-questions session, followed by the annual general meeting. The panel assembling under the questionmastership of Viscount Chandos this year will include Miss Mary George (director, EAW), Mr A. R. Cooper (member for operations—including nuclear and personnel, CEGB), Mr N. Elliott (chairman, South Eastern EB) and Mr S. F. Steward (director, BEAMA).

The annual report of the council of the convention, which is to be considered at the a.g.m., notes that in selecting as the theme of the convention "Electricity—the New Horizon," the council took the view that the papers at the convention "should be designed to enhance the prestige and public relations of the electrical industry rather than be concerned in too much detail with technical matters." The statistics appended to the report underline how this approach contrasts with the last visit of the convention to Bournemouth, in 1952. Then, 12 papers were read, falling into two main groups, domestic electrification characteristics and electrical research.

To end this preview, there must be noted one outstanding change from the preceding 11 conventions. Details of the proceedings will no longer be under the guidance of Mr J. W. Simpson as secretary. He retired during the year, and has been succeeded by Mr N. H. Tomblin, already well known to delegates through his work at the previous conventions.

1960 BEPC PROGRAMME

Day	Time	Event
Monday	10.00 a.m.	Supply industry delegates' conference (private)*
	1.00 p.m.	Rotary Club luncheon
	3.00 p.m.	Opening of conference; presidential address by Viscount Chandos
	8.00 p.m.	Mayor's reception and dance
Tuesday	9.30 a.m.	Hon H. G. Nelson (managing director, English Electric Co.): "The New Horizon — Electrical Manufacture"
	12.15 p.m.	EAW luncheon
	2.45 p.m.	Mr C. R. King (chairman, Electricity Council): "The New Horizon—Electricity Supply"
Wednesday	9.30 a.m.	Mr E. V. Small (joint managing director, AEI): "The New Horizon —Electrical Export"
	10.30 a.m.	Ladies' coffee—at home*
	2.45 p.m.	Mr T. E. Daniel (chairman, NWEB): "The New Horizon—Electricity in the Home"
	7.30 p.m.	Annual dinner
Thursday	10.00 a.m.	Electrical forum
	12 noon	Annual general meeting

* The supply industry conference is at the Odeon cinema, and the ladies' at home at the Royal Bath Hotel. All other events take place at the Pavilion.

AROUND THE TRADE

BY PEREGRIN

PERHAPS it was due to the soporific effect of this lovely May weather that the Chancellor's bombshell caused so little stir. Possibly the common sense traders expected, indeed welcomed, some such brake, with h.p. daily reaching new levels. It gave a timely warning to those who are inclined to use up their assets too quickly, and a reminder to those who overload themselves with h.p. debts that necessary everyday living costs still have to be met. I welcome these 20% and 10% settled deposits and restricted times for payment as, to keep pace with the extended terms offered by the Gas and Electricity Boards and the no deposit fourpence-a-week-for-life of some of the multiple shops, I have had to accept longer term agreements and smaller deposits than I like. Also, in face of such competition I find it difficult to restrain the somewhat short-sighted enthusiasm of my staff, with the inevitable increase in slow- and non-payers. Two years seems to me long enough for anyone to mortgage part of his income on domestic appliances and TV, and the professional people who like the no-deposit system and are usually steady payers should be able to exercise enough control to save the deposit.

Refrigerator Publicity

While the public has taken its time to get down to thinking all this out the refrigerator trade has got off to a very slow start in spite of the warm sunny days, but the weather may yet win the day for us. Better still, the refrigerator manufacturers may think out some new publicity and make the public realise that the "fridge" is a necessity for health and well-being as well as a vehicle for cold beer and party sweets. Such publicity as "Look—fingertip control" does not tempt the careful housewife with a limited income. She wants to keep her milk from going sour, her butter from going rancid and enough meat and salads to save a daily visit to the shops. People do not always grasp essential facts unless they are pointed out in words of one syllable. I actually heard one prospective customer remark on having the butter drawer pointed out to her "That would be no good to me. We have 4lb of butter a week."

Safety Legislation

What an excellent report the Maloney Committee has given. I have just been reading the electrical section in full and am struck by the common sense approach to the problems involved and the straightforward wording of the report. It is complete and concise, there is no suggestion of panic decisions, but there is a complete awareness of the reactions of manufacturers and public to any decision or act of law which may result from it. It accepts the fact that fatal accidents from electricity are relatively few, but suggests suitable legislation to deal with the existing dangers. No-one can stop what the report calls gross misuse, carelessness or inexpert tinkering, but the remedy suggested is better education in safety.

One minor matter struck me in reading the section dealing with the dangers of electric blankets—that we hear so little of the mattress overlay type of bedheater: a product of Thermalux Ltd. which the makers guarantee as being free from danger of fire or electric shock, even if a thermostat breaks down, and which I would say, personally, is almost incapable of being misused in the way which so often causes fire in ordinary electric blankets. It seems a pity that the comfort of a thoroughly warmed bed should be denied us through fear of fire and I have lain contentedly on my Thermalux in complete comfort and, I believe, safety for many years. I believe this model did not qualify for the Kite mark simply because BSI had no standard for it.

Socket Standardisation

I was pleased to notice the recommendations for the complete standardisation of domestic plugs and sockets, and I like the point that manufacturers could then supply their apparatus with a suitable plug correctly attached. What a lot of trouble that would save us! The trouble with standardisation is the difficulty in persuading the public that an up-to-date installation is as important as new wall-paper, and, also, the difficulty of persuading some local authorities to make up their minds which plugs and sockets to use on their housing estates. I know of more than one town where one can find Wylex, D & S and the standard 13 amp flat pin in comparatively recent housing sites. Of course, we are still up against the problem of what the standard plug is to be. We thought we had a winner with the flat pin 13 amp, but already we have a diversity of opinion as to the value of the contact surface of the flat pin against the round pin.

In matters of safety, one thing that could help us is greater care by the manufacturers in firmly attaching simple, concise and easily understood instructions to each appliance. *KEEP FLAT TO PREVENT FIRE* or *KEEP DRY TO PREVENT SHOCK* across each side of an electric blanket would be more telling than the usual couple of pages of complicated instructions. A tape attached to the cord and blanket to take any strain could be marked *DO NOT CUT*.

Educating the Public

With regard to education of the public, this is difficult, particularly with older people, when they buy by post or from some of the larger stores who are completely without any thought but sales and profit. Care, service, thoughtfulness or instruction are not in their vocabulary. But the good retailer trains his staff to give that little more in serving the public, both in the interests of satisfied customers and safety. Much good work is undertaken by the EAW in this matter of electrical education, especially in training the young citizens of the future in the schools.

Talking of the EAW brings me to "Viewpoint," the questionnaire which is the subject of their latest campaign. It is sub-titled "A Survey of Users' Opinion on Electric Equipment in the Home," but looking through it I confess I am in some doubt as to its ultimate aim. However, as I have used up my allotted span that must be "continued in our next."

Streamlined meter testing

E.E.B. OPEN NEW STATION IN NORTH LONDON

THE testing and overhaul of meters is one of those essential but routine tasks of an electricity supply authority and any development which can expedite the work is invaluable, particularly in view of the requirement that meters have to be re-certified every 15 years. The Eastern Electricity Board can call on considerable experience in this field, with a meter-testing station at Friern Barnet which dates from 1922, then, of course, operated by the old Northmet supply company. In additional premises on the same site, they now have a new testing laboratory to replace the original. This new station was opened last week by C. T. Melling, C.B.E., and together with a similar establishment at Norwich will provide all electricity meters for the board.

The premises are equipped for the maintenance and certification of some 140,000 meters per year, for renovating time switches, relays and portable testing instruments and for carrying out h.v. tests up to 100 kV. The staff employed on this work totals 136, under the control of F. G. Talbot, A.M.I.E.E., senior assistant engineer, meter and test. An examiner appointed by the Minister of Power is permanently stationed at the laboratory.

Dealing with the ordinary run of house-service meters, these are brought into the original building in batches of six, carried on hammocks in tubular steel frames. They are off-loaded onto a conveyor belt from which they are sorted into groups of the same make and type and carried, on multi-rack trolleys (specially made for this purpose from Dexion slotted angle) to store, where they are transferred to banks of slotted-angle racks, also mounted on castors for ease of movement.

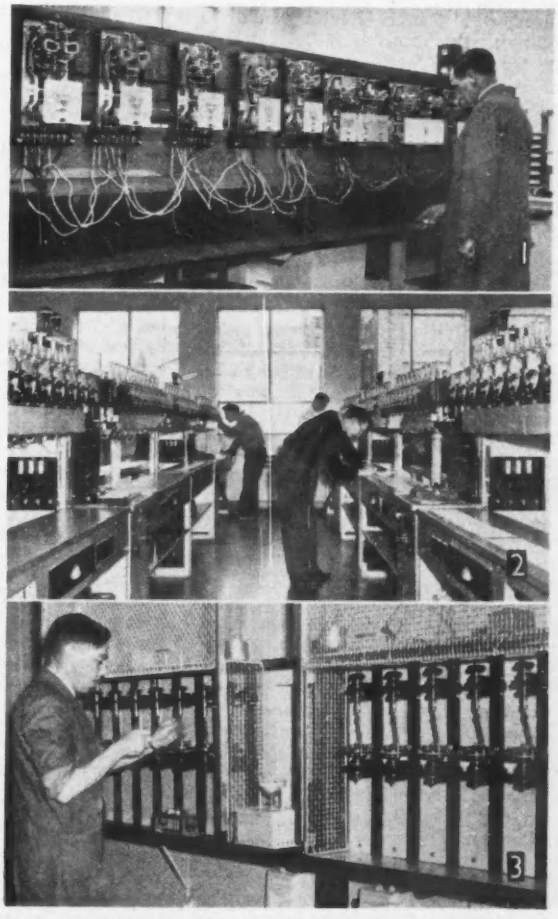
From the store, they are taken as required for overhaul. In the first stage, cases are removed for renovation. Plastics cases are buffed and the glasses wiped. With broken cases the usual practice is to cannibalise where spares are not available, although it is the board's experience that the spares situation for old meters is still quite good. Metal cases are cleaned with a metal brush and resprayed.

The movements of the meters are dealt with in the new building. About half the floor area is given over to house-service meters, one section for repair, the other for testing. In the repair section, the meters are mounted onto the specially high backs of the work benches, arranged in double-sided rows across the area, and the meter is dismantled. All moving parts are taken into a cleaning room adjoining the repair section, where they are cleaned in a series of chemical cleaners. Certain parts—meter discs and the first, second and third stages of the dial gearing—are then buffed. Jewels and pivots are dealt with in a second small work room off the main area. Suitable optical apparatus is installed to examine jewel and pivot profiles and surfaces.

After the work on the various components of the meter has been completed, the items are returned for re-assembly on the instrument from which they were taken. The assembled meter is then transferred to the test benches, which are similar to those of the repair section in that the same method of mounting is used.

The benches are provided with two mounting rails and, below them, the terminal arrangement, in which connection is effected by spring-loaded plungers mounted in blocks of insulating material. These are mounted on rods, along which they can be moved to cater for different spacings. Testing is by the dummy load method and voltage circuits are supplied through isolating transformers. In the centre of the bench is housed the standard against which the meters are calibrated.

Other departments in the station include a polyphase laboratory in which polyphase instruments are checked. Here is also undertaken voltage testing of insulating materials and the calibration of current transformers.



At the EEB's new meter-testing laboratory at Friern Barnet: 1, stop-watch checking of polyphase meters; 2, testing house-service meters 3, polishing pivots

OVERSEAS NEWS

from our correspondents abroad

CANADA

International View

An immediate programme of international co-operation to develop water storage and power sites on the St. John River as a prelude to eventual construction of the more expensive Passamaquoddy tidal power project, has been urged by Mr R. E. Tweeddale, general manager of the new Brunswick Electric Power Commission. He considers such a plan is necessary if the future power needs of Maine and New Brunswick are to be met in an order of economic priority. There is a proposal that the Passamaquoddy tidal power project combined with Rankin Rapids would be economically justifiable if built entirely by the United States at an interest rate of 2½%. Referring to this, Mr Tweeddale, while emphasising that the commission has not withdrawn its support of the Passamaquoddy project, points out that if a development of this nature should be undertaken, then it would be expected that the Province's rights would be adequately protected.

Grid for B.C.?

Planning of an integrated hydro-electric grid system was one of the greatest needs in British Columbia today, Dr Gordon Shrum, chairman of the provincial Energy Board, stated earlier this month. The cost of thermal-generated electricity was steadily coming down in price, and, in order to make use of BC's large sources of hydro, an extended network of circuits must be built. Dr Shrum, speaking to the Chartered Accountants Club of Vancouver, said his remarks on power were purely his personal views and did not necessarily reflect those of the Government or the Energy Board. He pointed out that development of a grid system had to be planned carefully. He envisaged a grid system tying in all of BC's hydro sources with the prairies, extending right across Canada within 15 years. Because of the time differential, the grid could meet peakload demands in different sections of the country. Dr Shrum said he was in favour of exporting electricity, like any other form of energy, if a market could be found for it. He thought that both the Peace and Columbia rivers would be needed by 1975. If one industry, using an amount of power equivalent to the Consolidated Mining and Smelting Co. at Trail, could be found for the north, "a lot of our problems in bringing in the Peace and Columbia at the same time" could be solved. The Peace River scheme was feasible, he said, and Columbia power would be cheap.

MEXICO

Complete Station Ordered

Associated Electrical Industries Export Ltd. have been awarded the first contract placed by the Comision Federal de Electricidad, Mexico, as part of their new Five Year Plan. The order, worth nearly £3¼ million, is for the complete plant for a new power station to be built at Ciudad Juarez. Generating equipment will comprise three 33 MW turbine-generator sets, with condensing, feed heating and de-aerating plant; also instrumentation and controls, boiler feed pumps, motors and water treatment plant. The order includes switchgear, transformers, control and relay panels, main and multi-core cables, battery and charging equipment, and all the station lighting, power points and earthing equipment, together with cooling towers, circulating-water piping and valves, motors and overhead travelling cranes. The contract includes designs for the buildings and civil engineering works, and the oil-fired boiler plant will be supplied by Babcock and Wilcox acting as sub-contractors. The first of the generating sets will be completed in 1961, and the whole of the equipment will be delivered within 3½ years from the date of the order. The steam turbines will be of single-cylinder construction designed for operation at 3,600 r.p.m. with steam conditions of 900 p.s.i.g. 900°F at the t.s.v., and exhausting to condensers at 28·25 in. Hg. at an e.c.r. of 24 MW with cooling water at 80°F. Five-stage feeding systems will be supplied. The boiler/generator units will be controlled from a central mechanical control room containing all instruments, controls and alarms.

JAMAICA

Conversion Plan

The Minister of Trade and Industry of Jamaica has recently announced that the island's electricity supply is to be standardised on a frequency of 50 cycles, replacing the 40 and 60 cycles systems at present in use. The work of conversion, estimated to cost £2.2 million, will begin in January, 1961, in the western part of the island, and completion in the Kingston area is expected by the end of 1962. Loans to cover the cost are being negotiated, and a £1·5 million loan is to be raised for further electrical development work. As a result of this scheme, it is anticipated that there will be considerable demand in Jamaica for mobile diesel generators, portable frequency changers and mobile substations, as well as for transformers, switchgear, etc. In preparation for a start on the frequency conversion work in the Savanna-la-mar region of Jamaica, a special scheme to train the necessary workmen has been initiated by the Electricity Frequency Standardisation Committee, in co-operation with the College of Arts, Science and Technology. A course of 12 lectures has been arranged for technicians engaged in the industry but who may not have knowledge of the basic principles of electrical theory. It is hoped that the scheme will provide sufficient men needed for the conversion work. Mr V. C. McCormack is chairman of the Electricity Frequency Standardisation Commission. To deal with matters appertaining to the course a committee of six has been established, including Mr W. H. Howell, acting chief engineer of the Electricity Division, Ministry of Trade, and a member of the Commission, and Mr H. C. Woodhead, frequency change engineer of the Jamaica Public Service Co.

ARGENTINE

Contract for Italy

The Government of the Province of Buenos Aires has recently signed a contract with the Italian Ansaldo Group for the construction and financing, over nine years, of a 66,000 kW power station in the city of Necochea. The proposed station will supply the southern part of the Province.

SWEDEN

Power Review

Output of water power in Sweden now amounts to 33,000 million kWh per annum, Mr Erik Blomqvist, chairman of the Swedish Water Power Association, stated at the association's recent fiftieth annual meeting. Latest estimates put total water power resources in Sweden at close on 200,000 million kWh, while the economically exploitable resources probably amount to 85,000 million kWh. No major change-over from hydro power to thermal

power is planned for the current decade. Total harnessed water power in Sweden amounted to 6,500 MW at the end of 1959—an increase of 300 MW during the year, according to Mr Bengt Sterne, manager of the association. The productive capacity at normal water flow increased from 31,000 to 32,500 million kWh. New plants in 1960 are likely to add a further 450 MW, some 300 MW of which is already completed. This would step up the output by approximately 1,500 million kWh, while a further 300 million kWh will be imported from Norway under a current contract. Major additions of thermal power were obtained during the past year through the completion of the first 150 MW stage of the Stenungsund plant, 88 MW from the Hässelby plant near Stockholm and 40 MW from the gas-turbine plant at Västervik. Two 20 MW plants have also been completed at Ortviken and Skoghall. Mr Tore Hedin emphasised that 92% of the country's total output of power is derived from hydro resources, and only 8% is thermal power. Current building schemes are not likely to change this proportion on a major scale. The question of nuclear power was dealt with by Mr Olle Gimstedt, former manager of the association and now with the private atomic power consortium AKK. According to a conservative estimate of future demand for power, a total installed rating of thermal power of at least 7,000-8,000 MW would be required by 1980. Of these about 20%, or 1,500 MW, would have to be nuclear power in order to obtain optimal over-all economy. Such a scheme would necessitate the building of half a dozen nuclear power plants of the 250-300 MW class in the 1970s, with the first unit operative in one of the first few years of the decade.

EUROPE

Power Export

Negotiations are in progress with the Hellenic National Power Supply Undertaking with regard to Turkey's supplying Greece with some 500 million kWh of electric power annually. Whatever the outcome of this project, it is intended to make an early start on the construction of an Istanbul-Edirne power transmission line, thus linking this frontier town with Turkey's N.W. Anatolian Grid. It is also reported that Istanbul is to have a new thermal power station; the only detail released so far is that fuel oil for the new station will be furnished by the Izmit and Mersin refineries.

Quest for Nationalisation

Nationalisation of the electricity supply industry has become a major political issue in Italy in recent weeks and although the subject seems to have been temporarily shelved, it is expected to arise again very shortly when a new government is due to take over. It has been stated that whereas the prices of commercial and domestic electricity in the UK were, respectively, 54% and 24% higher than the average price for industrial uses, in Italy the prices were, respectively, 221% and 239% higher. On the average Italian industrial electricity tariffs are only slightly higher than those in the UK (10·41 lire in Italy and 9·49 lire in UK), but tariffs for other uses differ markedly, it has been shown.

NIGERIA

More Funds

A £12 million loan arranged to be provided by the UK to Nigeria is intended mainly for the development of various public services, and includes extensions of electricity supplies. The loan, to be repaid over 20 years, is available for purchases of UK goods and services.

TASMANIA

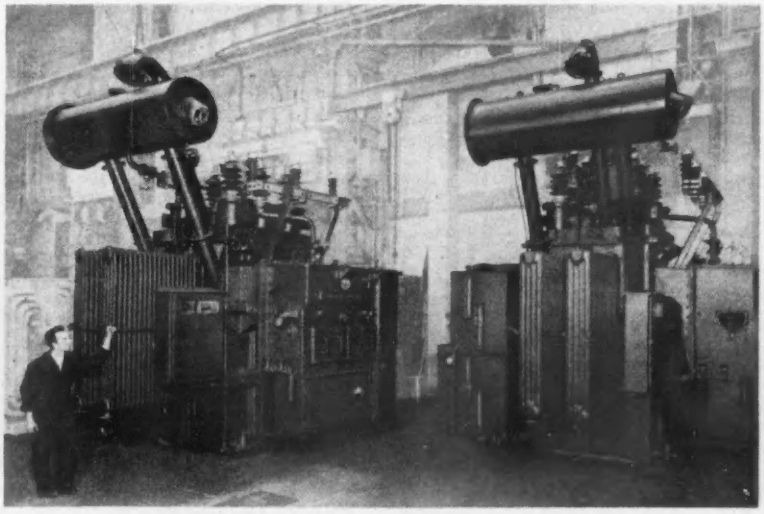
Looking Ahead

Legislation providing for a new hydro-electric scheme for Tasmania in the event of an appreciable addition to the demand for power was forecast by the Governor, Lord Rowallan, when addressing Parliament recently. Dealing with industrial developments, the Governor said that several industries already established in the State had announced expansion of activities. The Associated Pulp and Paper Mills Ltd. was to establish a plant at Wesley Vale. The Broken Hill Pty. Co. Ltd. and Australian Paper Manufacturers Ltd. were to establish plants at Bell Bay and on the Huon River at Geeveston, respectively. The known firm increases in demand for industrial power exceeded 60,000 h.p. That demand could be met by the Hydro-Electric Commission with its present works programme. Other negotiations were in progress and work on existing hydro-electric developments was being satisfactorily maintained. But the Government may find it necessary to approach Parliament for approval of a new power development earlier than previously contemplated, he added.

HONG KONG

Refrigerator Imports

Increased prosperity in Hong Kong brought a surge in the sales of domestic refrigerators last year, and, while the increase this year is not expected to be as high, there is an expanding market which British manufacturers should not overlook, according to the UK Trade Commissioner in Hong Kong. He has just reported that without any local production of refrigerators, the market is wide open, there being no import restrictions, duties or sales taxes, but for most purchases price is all-important. Even Japan's proximity has not greatly aided her attack on the market, it seems, for he reports that Italian refrigerators are cheapest, size for size, and achieved the largest sales last year, when the UK's share of the market dropped to 20%. The compressor type of machine is chiefly in demand, although some absorption type units are on the market. Local electricity supply is a.c. 200 V.



These two 10 MVA voltage regulators, ready for despatch at the Witton Works of the General Electric Co., may look somewhat unusual—they are built to American Standards. Intended to provide a constant output of 13·8 kV with an incoming supply which may vary between 11·75 and 14·5 kV, they are being supplied to the Arabian and American Oil Co., and are to be installed at Ras Tanura, near Dhahirn, Saudia Arabia. Designed for impulse testing at 110 kV peak full wave, they are fitted with surge diverters on both sides, and Buchholz protective relays are incorporated. The transformers have fully automatic on-load tap-changing, in 16 steps each of 1¼%, and are capable of parallel operation. They are also designed for the provision of fans, if required, which, it is estimated, would increase their rating by 25%

Personalities *in the industry*

Mr E. Asha

Mr D. T. L. Rettie

Mr C. A. Ganderton

Mr C. J. A. Cooper

Mr J. Conning

Mr E. Asha has been appointed manager of the Manchester office of Santon Ltd., in succession to the late Mr T. Johnston, to whom Mr Asha was deputy and a representative for some years.

Mr D. T. L. Rettie, M.A., has been appointed deputy managing director of AEI-Hotpoint Ltd. He is also joint managing director of AEI-Gala Ltd. (the export company of the Hotpoint Group). Mr Rettie was educated at Dulwich College and Magdalene College, Cambridge. He originally joined AEI-Hotpoint in July, 1956, as marketing director, after two years in a similar position with Beechams Foods Ltd. Now appointed manager, Marketing Department of AEI-Hotpoint Ltd., is **Mr C. A. Ganderton,** who was appointed marketing manager, home laundry, in December, 1957, became manager, Portable Appliances Division, in July, 1958, and general marketing manager in July, 1959. Mr Ganderton graduated B.A. in History at University College, Southampton.

A further appointment announced by AEI-Hotpoint Ltd. is that of **Mr C. J. A. Cooper,** F.C.A., as comptroller. From 1939 to 1940 Mr Cooper was assistant to the manager, Electrical Manufacturers' Finance Co. Ltd., a subsidiary of AEI, and accountant of AEI-Hotpoint Ltd. until 1941. He became secretary in 1945, and was appointed chief accountant in April, 1956. Mr Cooper was educated at Alleyn's School, Dulwich.

Chosen to be the first station superintendent at Uskmouth "B" power station, South Wales Division, CEGB is **Mr W. H. N. Clarke,** A.M.I.E.E., A.M.INST.F., who took over a similar position at the Division's Rogerstone power station in April, 1957. (*ESH, page 64.) Prior to going to Rogerstone, Mr Clarke was station superintendent at Newport power station for a year. Educated at Barnsbury Central School, Islington, and Northampton Engineering College, London, Mr Clarke started as an electrical tester with the Plessey Co. and after holding similar positions with A. C. Cossor Ltd. and Cambridge Instruments Ltd., joined the former Charing Cross Electric Light Co. in 1935 as automatic and manual substation engineer. Five years later he went to the London Power Co. as works power board and control engineer, and in 1945 became charge engineer of the Slough Trading Estates' power station. He then served in a similar capacity successively at the Bow Grove Rd and Battersea power stations of the London Power Co. and, in 1952, was appointed deputy station superintendent at Stepney, going to a similar post at Llynfi power station, South Wales Division, CEA, in August, 1954.

Mr F. H. Lomas, B.SC., A.M.I.E.E., has joined Turners Asbestos Cement Co. Ltd. as technical sales engineer in the Electrical Insulation Department. For the past 13 years he has been employed on electrical design and development work with Metropolitan Vickers Electrical Co. Ltd., now AEI (Manchester) Ltd., and recently he has been closely associated there with the development of a single anode mercury arc rectifier for use on a.c. multiple unit train equipment.

Formerly overseas contract manager of Prestcold, **Mr F. P. Childerhouse** has joined Kenwood Manufacturing (Woking) Ltd. as sales manager of their Refrigerator Division, responsible for the Kenwood/Norge range. Also previously with Prestcold as domestic refrigeration engineer, **Mr C. W. F. Longman,** B.E.M., M.B.E.I., A.M.INST.R., has also joined Kenwood as chief design engineer.

British Insulated Callender's Cables Ltd. announce that **Mr J. Conning,** A.M.I.E.E., formerly production manager, Power Cables Division, has been appointed works manager, Erith Works, responsible to the general manager, Power Cables Division. Mr Conning, who was educated at Prescot Grammar School and St. Helen's Technical College, served a short period of machine shop practical training with Prescot Clock and Mechanism Co. Ltd. In 1931 he joined British Insulated Cables Ltd. and was an estimating engineer on power cable systems until 1938. The next nine years were spent as a high voltage cable research engineer, followed by two years as technical superintendent, power cables, Prescot. In 1949 Mr Conning transferred to BICC's Erith Works as power cables department manager, responsible for the production there of all types of power cables. He became power cables divisional production manager in 1952, in charge of all BICC power cable production. Since that time he has played an important role in the major task of reconstructing and re-equipping the production unit and high voltage laboratories at Erith Works. Mr Conning was subsequently appointed production manager, Power Cables Division, in 1955.

Sir Wavell Wakefield, M.P., has been re-elected president of the Electric Vehicle Association of Gt. Britain. The new chairman of the association is **Mr A. P. Goddard,** of Austin Crompton Parkinson Electric Vehicles Ltd. Vice-chairman is **Mr H. J. Gibson,** B.SC., A.C.G.I., M.I.E.E., chief commercial officer, Midlands Electricity Board, and elected hon. treasurer is **Mr H. E. M. Bull,** of SEV (Sales and Service) Ltd.

Manager of No. 6 sub-area of the Yorkshire Electricity Board, **Mr C. Cameron-Kirby,** M.INST.C.E., M.I.E.E., M.I.MECH.E., has been elected chairman of the Hull and East Riding branch of the British Institute of Management for the coming session.

At present deputy station superintendent at Woolwich generating station, London Division, CEGB, **Mr J. E. Kedzlie** has been appointed station superintendent at Llynfi power station, South Wales Division. He succeeds the late Mr C. Carrick (*ESH, page 64). Mr Kedzlie started his career as a seagoing engineer and entered the electricity

* *Denotes revision to the "Electricity Supply Handbook, 1960."*

supply industry in 1933, serving at Ironbridge power station. Since then he has gained experience at Ford's power station, at Littlebrook and Deptford, and since 1951 has been deputy superintendent at Woolwich.

Mr J. Martin, COMP.S.A.I.E.E., has been appointed to the board of Mather and Platt Ltd. as head of the Pump Department. For the past ten years Mr Martin was managing director of Mather and Platt (SA) (Pty) Ltd. with headquarters in Johannesburg, and for 16 years prior to 1949 he was on the staff of the London office of Mather and Platt Ltd.

Mr P. F. S. Otten, president of Philips Lamps of Eindhoven, will relinquish the presidency at the annual meeting next year on reaching the agreed age of retirement. He will remain on the board as managing director and will also take over the chairmanship from **Dr H. L. Wolterson,** who will be appointed vice-chairman. **Mr F. J. Philips** will be appointed as the company's new president.

Mr Duncan Wright has been appointed a director and joint managing director of Hartley Baird. **Mr H. J. D. L. Walmsley** has resigned as joint managing director.

Mr J. H. Reed, managing director of Ericsson Telephones Ltd., has been invited to join the board of Telephone Rentals Ltd., but it is emphasised that there is no financial association between the two companies.

Station superintendent at Ince power station, North West, Merseyside and North Wales Region, CEGB, since Feb., 1954, **Mr Allan Parker,** A.M.I.E.E., A.M.I.MECH.E., M.INST.F., has been appointed to a similar post at the Region's new Padiham "B" Station as from 1 June. (*ESH, page 74.) Padiham "B" Station is still in the course of construction and will have an ultimate capacity of 240 MW. It is anticipated that the first turbo alternator set will be commissioned next February. Educated at Burnley Grammar School, Mr Parker studied at the Burnley Municipal College and the Manchester College of Science and Technology. He served with the former Burnley Corporation Electricity Department from 1921 to 1929, serving the last four years as assistant charge engineer before going to Oldham. From 1929 to 1945 he served with various Corporations including Manchester where he was shift charge engineer at Barton and Stuart Street power stations. In 1945 he was appointed deputy superintendent at Blackburn power station and in 1948 transferred to Clarence Dock in a similar capacity where he remained until 1954 when he took up his present post.

The Minister of Power has reappointed **Sir Anthony Bowlby,** BT., as a part-time member of the Midlands Electricity Board.

Mr W. James, manager of the GEC Osram Glass Works, Lemington-on-Tyne, has retired. He joined the company in 1919 at Lemington, subsequently spent six years at the company's works at Wembley and returned to Lemington in 1933.

The new head of the Isotope Research Division of the Atomic Energy Research Establishment at Harwell is **Mr B. S. Smith,** who was formerly head of Health Physics Division at Harwell. His successor in the latter post is **Mr N. G. Stewart,** at present head of the Health and Safety Division at Dounreay.

The General Electric Co. Ltd. announces the following appointments within its Radio Group: **Mr J. G. Turner** is manager, Battery Products; **Mr F. E. Pace** becomes van sales supervisor; **Mr H. J. Shaw** is supervisor, field engineering; and **Mr T. A. Julian** is service manager, responsible for the organisation, equipment and methods used in all Group service establishments. (Local service and personnel arrangements will be handled by area sales managers.) In addition **Mr C. E. Gerrett** will be internal services manager at new group headquarters for the London and Southern Area being set up at Hammersmith.

Mr E. H. Jubb, A.M.I.E.E., whose appointment as district manager at Gainsborough, to the Yorkshire Electricity Board, we briefly noted last week, has been in the industry for 29 years. He has served with the South East Yorkshire Light and Power Co., Buckrose Light and Power Co., London Passenger Transport Board, Kirkcudbright County Council, St. Austell and District Electric Light and Power Co. and the South Western Electricity Board. Since 1949 he has been senior assistant engineer (commercial) in the No. 7 (Grimsby) sub-area of the Yorkshire Electricity Board. He succeeds **Mr H. Doust,** A.M.I.E.E., who retires on 6 June.

District engineer at Grimsby to the Yorkshire Electricity Board, **Mr J. W. Watts,** A.M.I.E.E., GRAD.I.MECH.E., has been appointed senior assistant engineer (commercial) at the board's Grimsby sub-area, to succeed Mr E. H. Jubb, A.M.I.E.E., whose promotion to district manager at Gainsborough we note above. (*ESH, page 147).

Until recently area manager in the East Midlands for Revo Electric Co. Ltd., **Mr G. F. King** has joined Mansfield Factors (Electrical Supplies) Ltd., as sales manager (Electrical Division) for the group.

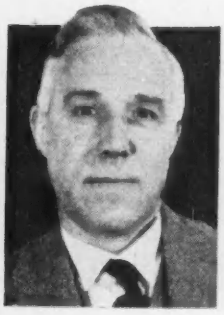
Mr G. E. Gilbertson, erection superintendent at South Wales for A. Reyrolle and Co. Ltd., has been presented with a gold watch to mark his 40 years' service with the company. Mr Gilbertson has been on Reyrolle's outside installation staff for 38 years, and has been superintendent in the South Wales area for 20 years.

Mr A. J. Beanland, B.SC.TECH., M.I.E.E., A.M.I.PROD.E., formerly director and general manager of the Trafford Pk works of Lancashire Dynamo and Crypto, has been appointed general manager of the Radcliffe works of Mather and Platt Ltd., and a special director of the company as from 1 July. Mr Beanland received technical training with Mather and Platt Ltd., Metropolitan-Vickers Electrical Co., Lancaster Corporation Electricity Dept., and graduated in electrical engineering at Manchester College of Technology. He served a post-graduate course with Lancashire Dynamo and Crypto Ltd., and after various engineering appointments with that concern he became their branch manager at Leeds in 1945. Four years later he was appointed manager of the Cardiff f.h.p. motor factory, and in July, 1951, became assistant general manager of the LDC Trafford Pk works. He was subsequently promoted to general manager there and elected a director of the company. In 1957 Mr Beanland visited Russia as a member of the delegation from the consortium known as Rustyfa, which secured a large order for a tyre factory.

Maj-Gen Sir Leslie Nicholls has joined the board of Arusha Industries.

Sir Charles Key and **Mr H. T. Collinswood** have been appointed additional directors of Pulsometer Engineering Co. Ltd. **Mr N. Tetlow** has resigned from the board of the company.

Mr J. Martin



Mr A. Parker

Mr E. H. Jubb

Mr A. J. Beanland

Mr Frank B. Lydall, M.B.E., ASSOCIATE I.E.E., chairman and managing director of Yorkshire Electric Transformer Co. Ltd., who has been chairman of the Dewsbury Conservative Association for the past nine years, is to be honorary treasurer of the Yorkshire Provincial Area in succession to **Mr Geoffrey R. H. Smith.** Mr Lydall has been a member of Mirfield Urban Council since 1949 and was chairman in 1952 and 1953. He is a member of Wakefield, Dewsbury and District Committee of the Regional Board for Industry, of which he has been chairman several times, and also of Dewsbury and District Employment Committee, Dewsbury Productivity Committee and Spen Valley Rating and Valuation Panel. He is past-president of the Engineering Allied Employers' Federation and president of Mirfield Agricultural and Horticultural Society.

Mr George Nelson, managing director of the English Electric Co. Ltd., has been named deputy chairman of the newly formed concern, British Aircraft Corporation Ltd., which unites the aviation and guided weapons interests of Vickers, the English Electric Co. and the Bristol Aeroplane Co. The new concern will have a capital of £20 million of which £8 million will be contributed by English Electric, £8 million by Vickers and £4 million by Bristol.

Further appointments, effective from 1 June, are announced by AEI-Hotpoint Ltd., **Mr A. W. P. Stephen,** B.SC.(ENG.), A.M.I.E.E., A.M.I.PROD.E., has been appointed general design manager (he was previously marketing manager, export and refrigerators, manager, Marketing Services Division, and market development manager), **Mr J. B. Smith,** becomes general marketing manager (he was earlier, marketing manager, home laundry), and **Mr D. B. Hunt** is to be chief accountant. Nominated industrial sales manager is **Mr H. W. Thompson** (he was formerly marketing manager, refrigerators); **Mr J. W. Kitson,** A.M.I.E.E., is to be manufacturing manager, AEI-Gala Ltd. (the export company of the Hotpoint group), and **Mr C. M. O. Jones** is appointed marketing manager, home laundry, while **Mr N. C. B. Abbott** will be marketing manager, refrigerators. In addition, **Mr B. Healey** is to be marketing manager, sheathed wire and special projects, and **Mr J. S. Kerridge** becomes marketing manager, portable appliances.

Mr A. V. Williams, B.SC., A.C.G.I., A.M.I.E.E., A.M.I.PROD.E., has been appointed to the board of Line Equipment Ltd. as works director. Mr Williams will continue as chief electrical engineer to the company, which position he has held for the past six years, following a number of years' service with the electrical supply industry.

OBITUARY

Mr F. G. Robb, A.M.I.E.E., formerly chief of the Test Division of Marconi's Wireless Telegraph Co., died on 14 May. He retired from Marconi's in July, 1955, after 36 years' service. Mr Robb worked on beam transmitters during the development of the Marconi-Franklin short-wave beam system. He was one of the team engaged in the design of the prototype 100 kW short-wave transmitter for the BBC, and was later concerned with the design of equipment for Alexandra Palace. He was seconded to the Admiralty during the war, becoming chief of Admiralty Radar Test. In 1948 he was appointed chief of Marconi's Test Division.

Mr E. A. Joyce who was head traveller for the General Electric Co. from 1918 until retiring in 1938, died on 14 May, aged 82. He was the first chairman of the Electrical Trades' Commercial Travellers' Association.

Mr C. H. Frankland, M.I.E.E., formerly a director of British Insulated Callender's Construction Co. Ltd., died on 19 May, aged 65. Mr Frankland joined Callender's Cable and Construction Co. Ltd. in 1910, and after rejoining the company from war service was appointed London district contracts engineer in 1929. From 1942 to 1946 he was manager, power cable contracts, and upon the amalgamation of the BI and Callender companies became manager, power and telephone cable contracts, in the BICC organisation. He had been a member of the board of BIC Construction Co. since its formation in 1949 until retiring last Oct.

Mr A. W. Dick, B.SC., M.I.E.E., who had been associated with the British Electric Transformer Co. Ltd. for over 30 years, died on 19 May, aged 61. For the past 12 years he had been in charge of the Order Section, and, earlier, was engineer-in-charge of the Tap-changing and Voltage Control Section.

Mr L. F. Jeffrey, B.SC.(ENG.), M.I.C.E., M.I.MECH.E., M.I.E.E., who was Divisional Controller of the East Midlands Division, CEGB, from 1951 until retiring in July, 1958, died on 5 May. Earlier, he had been chief generation engineer (construction) of the Midlands Division.

M. Georges Claude, the noted French chemist and physicist, and the neon lighting pioneer, died on 23 May aged 89.

NEW LITERATURE

Electronics

by A. T. Starr, M.A., PH.D., M.I.E.E.

A WORK which quickly established its popularity after publication six years ago, this textbook, specially intended to cover the requirements of the syllabus for the subject "Electronics" in the University of London Engineering Degree, now appears in its second edition. The text remains broadly unchanged, the major difference being a fuller description of semiconductors and transistors in the light of recent developments and brief inclusion of such high-frequency devices as the klystron and travelling-wave tube. Opportunity has also been taken to add some recent examination papers. Published by Sir Isaac Pitman and Sons, 429 pages, 8½ in. by 5½ in. Second edition, price 35s.

1960 Clean Air Year Book

A SUMMARY of the Clean Air Act and of associated regulations and by-laws is a feature of the latest edition of this year book. Also included is a guide to recent publications and reports, and a directory of organisations having interests in air pollution. Published by The National Society for Clean Air, 76 pages 8½ in. by 5½ in. Price 2s.

Millimicrosecond Pulse Techniques

by I. A. D. Lewis, M.A., A.INST.P., A.M.I.E.E., *and F. H. Wells,* M.SC.(ENG.), D.I.C., A.M.I.E.E., F.I.R.E.

PART of the publishers' series of monographs on electronics and automation, this is a second edition taking account of recent advances in this specialised field. The most notable advance has been, of course, in developing transistor-type devices capable of high switching speeds and a new section on this aspect has been added, together with other material bringing the book up to date and rectifying earlier omissions. Another change is the use throughout of the term "nanosecond" (abbreviated as nsec) instead of the original millimicrosecond ($=10^{-9}$ sec). Published by Pergamon Press, 417 pages, 8½ in. by 5½ in. Second edition, price 50s.

Electrical Year Book, 1960
Mechanical Year Book, 1960

THESE two annual handbooks appear again in their familiar colours, presenting a comprehensive reminder of many technical aspects in their respective fields. This year the two books show mainly the effects of detailed revision rather than extensive re-writing. Electrical Year Book, published by Emmott and Co.; 361 pages; 6 in. by 4 in. Price 4s. Mechanical World Year Book, published by Emmott and Co.; 362 pages; 6 in. by 3½ in. Price 5s.

BOOKS RECEIVED

Electronic Computers, by T. E. Ivall. Non-mathematical introduction to principles and applications. Published by Iliffe and Sons Ltd., 263 pages, 8½ in. by 5 in. Second edition. Price 25s.

Principles of Electricity and Magnetism, by V. Rocard. Translation of leading French text-book based on lectures delivered at the Sorbonne. Published by Sir Isaac Pitman. 779 pages, 8½ in. by 5½ in. Price 70s.

The Instrument Manual. Comprehensive review of British instruments, including bibliographies and buyer's guide. Published by United Trade Press Ltd. 742 pages, 11 in. by 8 in. Third edition. Price 105s.

The Universe of Relationships, by J. H. Reyner. Relationships revealed in various branches of science discussed with reference to the broader issues of philosophy and religion. Published by Vincent Stuarts Ltd., 130 pages, 8½ in. by 5½ in. Price 25s.

Problems of electronic engineers

I.E.E. SYMPOSIUM ON EQUIPMENT RELIABILITY

TO many engineers concerned mainly with power generation, distribution and utilisation, electronics is a world apart confined mainly to radio, television, telecommunications, rocket research and computers. This is, of course, not strictly true, since much in electron technology can be, and is already being, applied with advantage to every facet of the wider electrical sciences. To quote a current example, the whole of the switching, telemetering and protective systems on the 330 kV power lines radiating from the Kariba power station is effected by electronic means over the power lines themselves. Thermionic valves, mag-amplifiers, transistors and semiconductor diodes are all being increasingly used in power control equipment and a new race of younger engineers is rising who are to specialise in this field alone.

Apart from this, however, there is an extraordinary similarity between the experiences and viewpoints of the practising electronic and the power engineer, which is clearly evident from a perusal of the papers which were presented at a Symposium on Electronic Equipment Reliability arranged by the IEE in London on Wednesday, 18 May. About 30 papers were introduced by rapporteurs in three sessions dealing with user's requirements and problems, problems of system design and manufacture, and problems in the design and manufacture of component parts respectively.

Analysis of Life-time

A paper by R. Brewer, J. A. Lawrence and F. J. M. Laver attempts to analyse the life-time of electronic equipment by breaking up a week of life into the periods where it is in use or resting either as a natural operational function or through fault conditions, and they break the period down into 19 sections, only one of which is concerned with productive use. Among the others there are two which have a faintly familiar ring: failure due to external causes, "which includes spoilt work and time lost through causes outside the reasonable control of the operator or maintenance engineer" (failure of power supply, unauthorised tampering, sickness or accident, etc.), and "debatable time," in which is included an "unsatisfactory but unavoidable category of time lost through a difference of opinion between the maintenance engineer and the operator as to the state of the system."

Mr C. E. Clinch, dealing with the collection of fault data on a log sheet basis, deprecates a "ticking" system in that it does not give the amount of detail required, yet to give more detail would be costly and might create such an array of figures that the meaning would be difficult to assimilate. On the subject of reliability of transmission equipment, he discloses that in extended analysis of figures in the GPO, thermionic valves are rarely the cause of breakdown while capacitors, and electrolytic types in particular, are bad offenders. Plugs, sockets, valve-holders and switches are continual cause of faults, and accelerated life tests in the laboratory rarely bear any relationship to life in the field. On the subject of connections, the obvious comment is made that the failure of a soldered connection is as important as the failure of a related component. Soldered connections must be rigidly controlled and carefully inspected.

T. H. Flowers, also of the GPO Research Group, in considering the fully electronic telephone exchange, states that the economic life of equipment in telephone exchanges is up to 40 years, and says that an assurance by manufacturers that transistors and crystal diodes would survive that period would be welcome.

Electronic Computer Reliability

Electronic computer systems are now extensively used in business offices, where they are beginning to displace such traditional tools as slide rules and desk calculators. Mr J. W. Freebody remarks that users tend to take these machines very much for granted, since they require negligible maintenance and are rarely unreliable, and are shocked to find the much publicised equipment breaks down all too frequently, sometimes for long periods, which seems neither to surprise nor distress the designers. For its own good it must cease to be a glamorous gadget or publicity gimmick and must be designed and proved by thorough testing before marketing as a reliable tool for serious people. With that point of view no-one will quarrel. As he remarks in the final paragraph of his paper: "A reputation for reliability is an enduring asset whereas unreliability breeds distrust."

Mr D. W. Heightman, summarising the performance of a batch of 300 modern television receivers over the first year of life, discloses that short-circuit and soldering faults on printed circuit panels are not excessively high; in fact they are lower than in conventionally wired receivers. Mr F. G. Tarrant was more concerned with the reliability of weapon systems and the relationship of maintenance and serviceability. It was estimated that, for a certain weapon system, the maintenance effort required for 90% serviceability would be approximately five times that required to achieve 60% service. Clearly this was a case where all depended on the maximum reliability of components and ease of maintenance in circuit design. The economic penalty of high serviceability in a weapon is diametrically opposed to its usefulness at the critical time.

Electronics and Civil Aviation

Unserviceability of any equipment on civil aircraft results in unscheduled delays. If it is an electronic component it can usually be completely replaced in a matter of minutes, always providing that the replacement is available at that particular airfield. But, as Mr J. Symonds points out in his paper, minutes cost airlines money and a short-haul airline with an average of 300 departures per day, with an average delay of only seven minutes, can lose no less than £3,000 a day. To meet this contingency, airlines like the BEA set up check periods at routine outstations where replacement parts are located to enable servicing and routine removal of units for bench testing

and adjustment to be carried out instead of waiting for faults to occur. At the fourth check period, after each 3,000 hours flying, all units are removed for full overhaul and inspection and the desirable design target for all electronic equipment is, therefore, a minimum life of 3,000 hours in service. This target has to be borne in mind against a constant background requirement of minimum bulk and weight, since each pound of weight in equipment can represent a revenue loss of £100 per aircraft per annum. It is pointless to achieve such savings in weight if, by doing so, serviceability is correspondingly reduced.

Mr Williams, of International Computers and Tabulators, has a different complaint. He says that, as things stand today, most manufacturers of components are able to provide very little information regarding the reliability of their products, while some admit that the users know much more about them than the makers do. Few manufacturers appear to know a great deal about the behaviour of their products beyond the 2,000 hour endurance test specified for type approval. Providing that the components pass the test they seem reasonably satisfied.

Mr Beaufoy, of British Telecommunications Research, advocates "marginal testing," that is, the replacement or changing of working conditions on equipment at regular intervals shortly before the estimated probable time of failure, instead of waiting for failure to occur.

Damage During Maintenance

Another familiar note was struck by Mr J. Price, who deals with the prevention of unreliability through accidental damage. He says that an important design consideration for an equipment containing a large number of semi-conductor devices is that of minimising risk of accidental damage by the maintenance engineer. As he withdraws a crocodile clip or probe from a test point, he may momentarily, and often unconsciously, short-circuit two tags or wires. With valves the result would rarely cause trouble, but with transistors or crystal diodes damage can easily occur. Sometimes the damage is not immediately apparent but results in failure days or even weeks afterwards. Two important design steps are advocated; first, the provision of special test sockets at safe positions and, second, the planning of the wiring layout to avoid the possibility of accidental short circuits between tags or wires.

Mr F. Scowen was concerned with the reliability of performance on repeatered submarine telephone cables, and rightly so, since, according to him, the cost of repairing a fault in mid-Atlantic might range from £30,000 in good weather to as much as £½ million in stormy weather. Most cable faults occur in shallower waters and are due to mechanical damage through fouling by trawlers' gear, but the failure of an electronic component costing a few shillings in a deep-water repeater is obviously a far more serious matter than the failure of the same type of component in more accessible equipment. The GPO design policy is for the submarine section to have a life of at least 20 years and, though there is no way known to actually guarantee this objective, the obvious practice to adopt is to use only the best of well-tried components, manufactured under rigorous control, and then to run them at between a quarter and a tenth of their commercial ratings. Production samples are life-tested under normal and accelerated conditions, sometimes to the equivalent of 2,000 years of life without failure; spacings between uninsulated points are sufficient to withstand eight times the maximum operating voltage; whisker-growing metals are entirely eliminated—these are but indicative of the many precautions to ensure long life without failure.

Facts About Semiconductors

Mr R Brewer, of the GEC Laboratories, takes up cudgels against those who complain that manufacturers are unwilling, or are unable, to make any statements about the reliability of their semiconductor products. It is his view that manufacturers are hampered by uncertainty about the operating conditions under which the devices are expected to work. Given this information, there is little fear that semiconductor appliances can be provided to meet almost any condition in service, and this is supported by schedules of semiconductor junction diodes tested to between 500 and 1,000 hr from which only 9 out of 2,448—or 0·35%—gave trouble while, with junction transistors (germanium), only 4 out of 6,312—0·063%—failed to survive. Other devices, however, have run up to 25,000 hr without failure. Where failure does occur a large part of the responsibility may be due to transient conditions. With the extending incursion of semiconductors into the power field, these observations are of more than passing interest.

Making a similar review on CV4000 series thermionic valves, he again asks for more specific information as to service conditions before the design stage is completed. It is unrealistic to expect a designer to produce an efficient valve to an all-embracing specification. From the users' standpoint there is everything to be gained by using a valve chosen for its specific performance than one for general conditions.

Printed Circuits

Mr D. J. J. Davies next dealt with the production aspects of reliability of printed circuits. Early production units suffered a variety of drawbacks which were largely due to inadequate attention to standards of cleanliness in manufacture. Both in the production of the etched copper-clad boards and in the assembly of the additional components, cleanliness must be maintained throughout.

Mr A. Fairweather, discussing light duty relay contacts, asked for more critical re-evaluation of the time-honoured techniques of precious metal electroplating and, secondly, for a single, adequate and universally accepted performance standard and test-procedure. In a related paper, Mr N. E. Hyde discussed the reliability of the relays themselves. Although he was referring mainly to the miniature and micro types of relay in missile engineering, many of his comments have equal force in relays for power circuit applications. An important reflection is that the miniaturisation of relays for aircraft and missile use, which have been developed to meet requirements of light weight and reliability under onerous environmental conditions, could have valuable influence on relays for power fields.

In the final paper, Mr H. J. H. Wassell dealt with the attitude of mind in production and its effect on reliability. "It is almost axiomatic," he says, "that an equipment cannot have more, and can so easily have less, reliability than has been designed into it. In a perfect world the producer, transporter and installer would 'only' have faithfully to reproduce the design." How very much hangs on that word "only"! "The general existence in production of an attitude of mind tuned to look for incipient unreliability will undoubtedly catch some features that would otherwise give trouble in service. It can equally pay dividends in getting production running smoother at an earlier date, for there is no greater cause of production confusion than the insertion of modifications designed to overcome unreliability found in service."

That applies, without any qualification, to every field of engineering production.

N.P.L. gives up h.v. research

AS part of their policy of effecting a concentration of effort into a limited number of fields, the NPL is negotiating with the CEGB and the ERA for transfer of all high voltage work from the NPL. This is one of the features of interest to the electrical industry contained in the annual report of the executive committee.

During the year the high voltage laboratory, which forms a section of the applied physics division, continued their studies, undertaken for the CEGB, of factors affecting wet flashover of insulators. These studies are aimed at explaining variability encountered in evaluation of test results and to formulate a better specification. Examination of the method of producing the water spray shows that the plain jet, as used in Switzerland, gives a more uniform drop size and angle of fall than the spiral jet used in America.

The effects of humidity on flashover of large insulators will be studied in a humidity chamber now under construction, and work is proceeding on the mode of flashover under d.c. voltage stresses for insulators with different geometries, namely, cap-and-pin, pedestal post and cylindrical post.

Other work being undertaken by the section includes a review of literature and activities on insulation co-ordination techniques, and life tests on capacitors for the UKAEA. A report has now been prepared on the breakdown of solid and liquid dielectrics undertaken for the ERA. Flashover and puncture of paper and pressboard in oil under various types of electrical stress, including breakdown between covered conductors with 2 microsecond pulses applied and on relative behaviour at different temperatures, form the subject of this report.

The electrotechnics section have, during the year, improved facilities in the resistance room to meet the increasing requirement of industry for accuracy of resistance measurement, previously only necessary for international standards. A temperature controlled enclosure has been added, and in this enclosure it will now be possible to compare commercial resistors with standards to an accuracy of a part in a million.

A 1,000 megohm high resistance standard has also been completed and long-term stability tests will be made on this and other standards.

An important investigation is being pursued on the use of transistors for measuring purposes and they are proving useful as detectors in a.c. bridge methods. Zener diodes are also being studied for possible use as voltage standards.

Computers and Electronics

The major part of the ACE computer is now in working condition and this will supplement the existing facilities provided by DEUCE, on which the operating time has been increasing during the year rather than decreasing as expected. However, work undertaken for outside organisations continues to decrease due to the wider use of computers by industry.

A computer application being developed is the programming of ACE for translation of Russian into English. First stage in translation is to consult a coded dictionary and in this respect the NPL have benefited by the gift of a coded Russian dictionary recorded at Harvard University. Subsequent work will be devoted to sentence analysis and the synthesis of corresponding English sentences. Initially, translations will be restricted to mathematics and electronics.

In the control and electronics division, progress has been made on the development of a planar cryotron—a superconductive switching element which will probably be applicable to computers and which will operate in millimicroseconds. The cryotron consists of superposed layers of superconducting materials which give extremely rapid switching when cooled to the temperature of liquid helium. The resistance of the cryotron when it is in a magnetic field is a function of temperature. Present materials are not giving sufficient current gain, but work is proceeding.

Steels for Power Stations

Work on creep resistance of steels for use in power stations, which has occupied a section of the metallurgy division for many years, is to be expanded and transferred, partly to the ERA new Leatherhead laboratory and partly to the National Engineering Laboratory at East Kilbride. Work on an experimental 30 in. diameter rotor in molybdenum-vanadium steel is now ready for publication and tests on full-scale superheater tubes in austenitic steels are planned to ascertain whether advantages promised by laboratory tests will be realised in practice. Experiments on resistance to thermal fatigue of steels used in boiler plant suggests that austenitic steel is superior to two ferritic steels tested, but, on the other hand, its internal thermal strains are greater because of its greater thermal expansion and lower thermal conductivity.

The aerodynamics division has developed a new device for reducing the conditions of local pollution resulting from a factory chimney operating with low efflux velocity. Secondary air is discharged into the chimney wake by jets mounted on the side of the chimney

Work in the acoustics section of the applied physics division has included investigation of noise in and around factories, and their industrial investigations also include cases of circuit-breaker noise. The section have also been engaged on development of the massive sound insulating partitions used for separating the new Associated-Rediffusion television studios at Wembley.

The testing group covering the photometry of electric lamps is now installed in its new quarters. During the year the number of tubular fluorescent lamps tested increased, and for this purpose the 15ft integrating sphere was in constant use. In addition to calibration of working standard lamps, the section work includes life tests and inspection of factory lamp testing equipment.

SURFACE BREAKDOWN OF DIELECTRICS

DISCUSSION on the paper "The Resistance of Sheet Insulation to Surface Discharges" (page 813, 19 May) was opened by MR P. R. HARTSHORN who referred to the author's comment that the results he had obtained should not be used for design purposes. This did not make the research less valuable. The complex nature of the problem necessitated an approach under idealised conditions which might conceivably be applied to design where the ideal conditions were likely to be approximated in practice. Where conditions were far from ideal, as was more often the case, the dissenting factors could be taken into account. Two important ones among these were resistance to water and resistance to chemical attack. If these were evaluated and taken into consideration with the surface discharge resistance according to Dr Mason's figures, a fair indication of behaviour to be expected in service might be approximated.

MR G. LEROY referred to the many parameters involved in a study of surface breakdown all of which were impossible to simulate at the same time under laboratory conditions. One had to select only a few and the value of the results in relation to subsequent service experience depended upon the choice made. Apart from the purely scientific view there was also the practical aspect as viewed by the user. Chemical action of the degradation products was of vital significance in breakdown studies and this had been studied in several separate cells of research in France, some of which would be described by Mde Fallou.

MR K. H. STARK, dealing with the aspect of electrode design, favoured the use of rods rather than point electrodes as proposed by Rowlandson some years earlier, but he was not so happy about the author's comments on the use of dry air. His own experiences tended to show that, so long as the samples had reasonable access to ambient air, the question as to whether it was dry or in motion made little difference.

MDE FALLOU described the procedure with respect to the work being carried out in France in which plane electrodes were laid parallel to the specimen, thereby spreading the stress over a larger area. As a result, the regions of breakdown were determined, not by the configuration of the electrodes but by the weakest points of the specimen, which was important with heterogeneous insulating materials.

MR LANG also described a type of test cell used by his company in which the measurement circuit included an impulse counter and a coulombmeter. Preliminary tests showed that the number of coulombs was related to the mechanical wear of the insulation and was independent of frequency, applied voltage or air gap.

MR W. P. BAKER said it might be asked why it was necessary to present proposals for a test after nearly 100 years of engineering. Engineers had a wealth of experience of traditional insulating materials, but requirements were now becoming increasingly severe and newer materials were coming forward to replace the traditional ones. We could not wait up to 30 years for knowledge of long term behaviour.

MR N. PARKMAN, concurring, said that criticisms of the difference between service and test conditions could be levelled against any accelerated test but we had learned to get a great deal of information from accelerated tests which was useful to the designer.

MR J. K. WOOD asked whether results were available with the older fashioned materials like glass, vulcanised fibre, porcelain, etc. This would be useful so that the performances in service of modern polymerised insulating materials could be compared with the known performance of the established types.

Dr Mason briefly replied.

Classifying Cable Soils

CABLE engineers often need to describe the soils in which their cables are to be laid. The ERA has evolved the descriptive scheme outlined in the accompanying table, basing it on a look-feel-squeeze-pinch routine. An investigation (ERA Report F/T198) suggests that with experience, observers using this system produce repeatable results. Squeeze means squeeze in the hand to form a "cast"; pinch means pinch between the finger and attempt to produce a ribbon as can readily be done with putty.

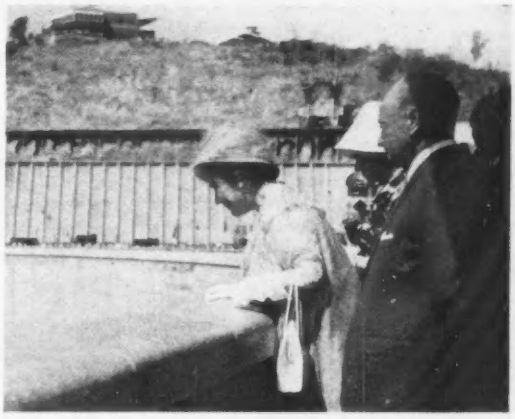
This is the first step in a programme of work which may lead to an alignment of the soil types with soil thermal conductivity properties, so that quick observation of the cable route will permit decisions on the ratings to be allocated to the cables.

Besides the classification for the soils set out in the table, the following letters are suggested for more readily recognised soils: top soil, I; limestone, K; chalk, L; shale, M; made-up ground including builders' refuse, N; and made-up ground including cinders, ash and clinker, O.

Table I. Schedule for Classification of Sand and Clay Soils and Organic Soils

Look	Feel	Squeeze	Pinch	Soil Classification
1. Loose particles; mostly larger than $\frac{1}{16}$ in. in diameter.	1. Gritty, i.e., the grains of soil can be felt	1. A cast cannot be formed		A
2. Crumbly with no clods of earth. The grains can easily be distinguished		2. A cast can be formed but it crushes if touched again	1. Does not stick together	B
		3. A cast can be formed and can be handled with extreme care		C
3. A mixture of clods with crumbly earth	2. Fairly smooth, but some roughness		2. Sticks together but a perfect ribbon not produced. A broken appearance (i.e., cracks, etc. appear)	D
	3. Smooth but not greasy	4. A cast can be formed and freely handled	3. Forms a ribbon which breaks quite easily	E
4. Compact material, possibly looking wet and rather greasy separate grains are too small to be distinguished	4. Smooth and possibly greasy		4. Forms a strong ribbon	F
5. Finely divided, thoroughly decomposed black organic material	5. Finely divided soil	5. Compressible soil—the extent depending on relative quantities of organic and inorganic soil. The more organic, the more compressibility	5. Sticks together, but there is no great strength and any ribbon produced is not perfect	G
6. Predominantly organic material black or dark brown in colour and incompletely decomposed	6. Highly fibrous soil	6. Very compressible soil. A spongy feel		H

Kariba Royal Opening



Right. The Queen Mother and the chairman of the Federal Board, Sir Duncan Anderson, look over Lake Kariba from the dam walls

Below. The impressive moment as H.M. the Queen Mother starts the second 100 MW turbo-generator from the stand outside the control station high above Kariba Dam

Bottom. In the underground power station the Queen Mother receives the engineer who is in charge of the erection of the giant Boving turbines. The top of the two completed alternators is visible in the left background

equipment for industry

Welding and heating innovations

RECENT introductions in the field of industrial heating and welding include an induction and dielectric heater and two welding machines.

Designed specifically for gettering radio valves but also suitable for small part heat treatment, is a new induction and dielectric heater. Known as the model 25, it has an output of 2·5 kW at 200/250 V a.c. or an output in excess of 1 kW at 400 kc/s. *Induction Heating Equipment Ltd., 11 Molesey Rd, Hersham, Walton-on-Thames, Surrey.*

Spot welding at speeds in excess of 750 spots per minute and with each spot timed to an accuracy of 100% is the claim made for the "Synchrospot" self-contained equipment. Accurate timing, obtained by using a four-channel spot welder control of the fully synchronous digital type, is claimed not only to give a much higher spot rate, but also to improve electrode tip life and to eliminate the need for extra spots usually applied as a safety factor with non-synchronous welders. The "Synchrospot" permits four synchronous time ranges of 1-90 cycles each. Phase shift heat control is employed, permitting a critical weld setting to be obtained and also eliminating need for a tap changing on the transformer unit. "Synchrospot" control, complete with a heat regulating panel and ignition contactor is housed in a cubicle with a 12 in. by 18 in. base. Controls are mounted behind a Perspex, lockable window to prevent unauthorised adjustment. *Sciaky Welding Machines Ltd., Slough, Bucks.*

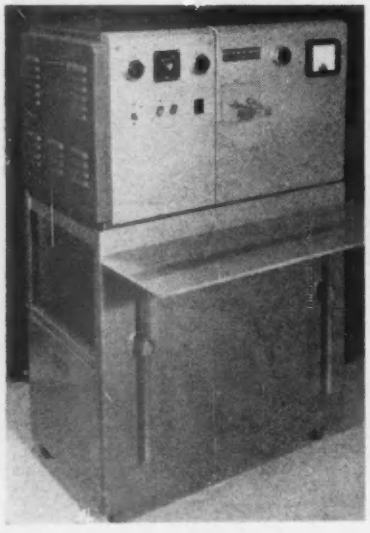
Welding equipment designed specifically for horizontal welding of large cylindrical oil storage tanks and chemical vats, recently announced, is claimed to reduce welding time to one-tenth. The equipment consists of two welding heads slung from a carriage which runs on the top of the vessel side, the two heads weld the seam on the outside and inside simultaneously. Known as the Circomatic, the machine uses the "Rockweld Comet" method of visible arc welding under a carbon dioxide gas shield. *Rockweld Ltd., Commerce Way, Croydon, Surrey.*

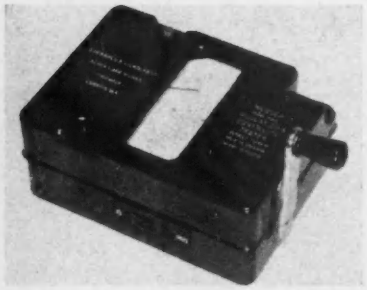
Introducing "Megger" Series 3

OVER a period of many years the "Megger" insulation tester has succeeded in establishing an almost unrivalled place in electrical test and inspection departments. A new instrument, the series 3, Mk III "Megger" has recently been put on the market incorporating many advanced features. The instrument has the well-known true ohmmeter movement enabling circuit resistance to be checked without any preliminary scaling and therefore enabling the instrument to be used by skilled or semi-skilled personnel. Continuity testing down to 0·1 ohm is possible with the instrument, partially because of a new design of hand-driven generator which dispenses with regulating circuits and constant speed devices. Three versions of the instrument are available, the 500 V version ranges from 0 to 100 megohm and infinity on the insulation range, and 0 to 100 ohm on the continuity range. On the 100 and 250 V models the same continuity ranges are available as on the 500 V version but the insulation resistance ranges are 20 and 50 megohm, respectively. The new version is the same size as its predecessor, 5¼ in. by 4 in. by 2¾ in., but a stronger, impact-resistant phenolic-resin case has been used. Improved design of the miniature generator provides the correct test voltage at 160 r.p.m. and this does not rise more than 10% if the turning speed rises to 300 r.p.m. Special design of the generators, and nylon gear train drive has reduced the effort required to operate the instrument considerably. *Eversheds and Vignoles Ltd., Acton La, W.4.*

New semiconductors

OVER 70 semiconductor devices are included in 11 series now available from Texas Instruments. These range from computer and radio transistors to silicon cells for punched tape read-out systems. The selection includes a series of silicon controlled rectifier rated 3 A at 50 V to 400 V. These devices are suitable for a temperature range from −65 to +125°C and are claimed to be primarily for motor-speed control, inversion and power switching devices. They require about 20 mA gate current to turn them on and the circuit is maintained by a gate current of about 5 mA. For use as temperature compensating devices in transistor circuitry and also for temperature sensing, a range of "Sensistor" silicon resistors has been introduced. These have a positive temperature coefficient of 0·7%/°C and are available in ratings of ¼ W and ½ W with resistances from 100 ohm to 1 kilohm. A power germanium transistor, rated 25 A at 80 V is believed to have the highest current rating available in the UK. *Texas Instruments Ltd., Dallas Rd, Bedford.*

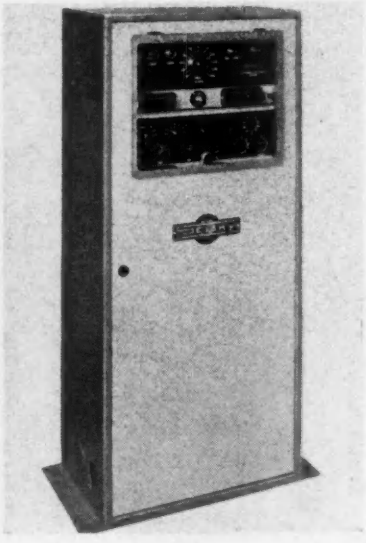




Improved continuity range and easier operation are features of the "Megger" series 3 insulation tester

◀ *Induction and dielectric heater for gettering radio valves made by Induction Heating Equipment*

The Sciaky "Synchrospot" spot welder claimed to give accurate weld control at more than 750 spots per minute ▶



for the electrical trade

New sander

A NEW orbital sander designed for heavy duty is produced in the "ELU" range of woodworking machinery. Its 250 W induction motor is claimed to be noiseless and robust enough to withstand plenty of ill-use on the building site. A foam rubber mounting on the sander protects mechanical parts from water and grit, though waterproof sandpapers are supplied for use in wet locations. Bristle pads or wire brushes for polishing and de-rusting metal may be interchanged with the foam backing. The head has a sanding area 4½ in. by 8 in. Weight: 7½ lb. Price, including 12 sanding papers, £22, delivery from stock. *Trend Industrial Equipment Ltd., 95 Dudden Hill La, N.W.10.*

Warming cable price reduction

AERIALITE announce that prices of their floor-warming cables have been substantially reduced. This price drop coincides with an extension of the range to include loadings in multiples of 0·1 kW. Ratings from 0·8 kW to 3·8 kW are now available. All cables are now supplied with polythene insulated and p.v.c. sheathed cold terminations. The range is backed by a full selection of fixing accessories, controls and thermal insulation materials. *Aerialite Ltd., Stalybridge, Cheshire.*

Hoovermatic extra

FROM now on "Hoovermatic" washing machine/spin dryers will be supplied complete with full width table-top lids at no extra charge. The lids present a durable plastic working surface, resistant to abrasion and staining. They are mottled grey and white, with polished aluminium edges. Handles are fitted at each end. Owners of existing machines can obtain the new lids from their dealers at £3 17s 6d. *Hoover Ltd., Perivale, Greenford, Middx.*

New translucent tube fittings

TWO new models have been added to the "Tubalux" range of fluorescent fittings. The two lines, designed for 40 W and 80 W tubes, have opal "Perspex" removable diffusers and stove enamelled metalwork. Prices, including purchase tax, T435 (40 W) £14 2s 3d, and T535 (80 W) £15 14s 6d. Switchless start models are available at a slight extra charge. *Troughton and Young (Lighting), 143 Knightsbridge, S.W.1.*

TRADE PUBLICATIONS

ASHLEY.—38-page booklet and new price-list of electrical accessories. Cat. No. 27. Ashley Accessories Ltd., Ulverston, Lancs.

ATE.—16-page brochure on sound communications. Communication Systems Ltd., Norfolk St, W.C.2.

ARCO-SEAL.—Pamphlet on motor proofing process for windings protection. Arco, 2245 Coventry Rd, Sheldon, Birmingham 26.

B. AND R.—Loose-leaf catalogue describing range of relays by B. and R. Relays Ltd., Temple Fields, Harlow, Essex.

BRYANS.—Several new folders describing thermo-couples, manometers, system testers and controls. Bryans Aeroquipment Ltd., Mitcham Junction, Surrey.

CERAMITE.—18-page booklet on wire-wound ceramic embedded resistors. Details of higher value windings. TG issue 4. Zenith Electric Co., N.W.2.

E.E.—20-page brochure on die casting and shell moulding. DC/101 and 12-page brochure describing the EM85 gas turbine. English Electric Co., Foregate St, Stafford.

FOLIAC.—Pamphlet GP59/60 on colloidal graphite for drop forge die lubrication. Graphite Products Ltd., Northfields, Wandsworth Pk, S.W.18.

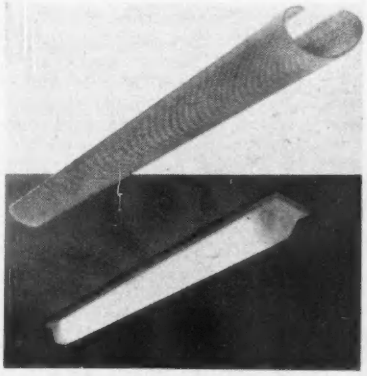
GEOPI.—48-page price catalogue on traffic controls. Geo. Pike, Alma St, Birmingham 6.

HOLMES.—Pamphlet on light duty Bag Filter. W. C. Holmes and Co., Gas Cleaning Div., Turnbridge, Huddersfield.

NEVELIN.—Eight-page pamphlet on silicon rectifiers. Lancashire Dynamo Nevelin Ltd., Hurst Green, Oxted, Surrey.

NYLOC.—16-page brochure on self-locking nuts. Simmonds Aerocessories Ltd., Treforest, Pontypridd, Glamorgan.

REYROLLE.—Brochure describing Class LMP switchgear including an illustration of the panel built up on six sides of three Cellophane pages to show interior layout. Also pamphlets on Class OS switchgear, time-lag relays, type J8 circuit-breaker, etc. Reyrolle and Co. Ltd., Hebburn, Co. Durham.



Top: The Siemens Ediswan clip-on diffuser for use with plain 5 ft batten-type fittings Bottom: "Tubalux," a complete fitting with "Perspex" diffuser

Deep-freeze luxury

THE "Frimatic" range of large capacity refrigerators offers every current luxury, including deep freezing, in cabinets of seven contrasting colours. Compressor models, incorporating "Tecumseh" sealed units, all but the smallest have a special deep-freeze compartment for storage of frozen goods. An unusual feature of the two largest models (7 and 9 cu ft capacities), is the "Multiblock" door-storage system. The door shelves are in fact long enclosed containers hinged at one end so that they swing outward, the advantage being that they can be filled to the brim more safely than open shelves.

Particular attention has been paid to efficient circulation, for the "cold convector," a device exclusive to this range, creates a through draught from a grid in the rear of the cabinet, distributing cold air evenly through all the shelves.

All five models have automatic interior lighting and capacious crisper trays. Colours available: yellow, green, ivory, blue, black, a coral pink, and white. These refrigerators are imported from France, but have been built to British Standards specifications. Capacities and prices are as follows:

Model 110	4 cu ft	£66	3s
Model 140	5 cu ft	£72	9s
Model 162	5½ cu ft	£82	19s
Model 200	7 cu ft	£97	13s
Model 260	9¼ cu ft	£125	

Distributed by *Edmundsons Supply Corpn., 250 Ferndale Rd, S.W.9.*

Big freezers in small cabinets

A RANGE of moderate capacity compressor refrigerators to follow the latest trend toward maximum freezer space is "Easiclene," comprising three models. The smallest, a 2·5 cu ft cabinet, can be installed with legs and a table top as a free-standing unit, wall-mounted, or built in with other kitchen units. Its freezer space is 152 cu in. The 4·2 cu ft cabinet has a 620 cu in. freezer compartment and is supplied complete with plastic table top. The largest of the trio, a 5·5 cu ft model, has a full width 720 cu in. freezer and again a plastic table top. All interiors are one-piece moulded polystyrene and, in the case of the two larger cabinets, automatically lit. Prices £48, £70 and £78 including purchase tax. *Easiclene Porcelain-Enamel (1938), Wolverhampton.*

Clip-on diffuser

SIEMENS EDISWAN have produced a plastic diffuser that clips on to a fluorescent tube, transforming the bare batten type fitting into an attractive lighting unit. Designed for use with 5 ft battens, it is of reeded "Diakon," elliptical in section, and fitted with nickel-plated spring clips which grip a 1½ in. diameter lamp. "Diakon" is stable in all atmospheres and, like "Perspex," has good light transmission properties. Price is £3 2s 9d including purchase tax. Catalogue No. 18/8. *Lamps and Lighting Dept., AEI Radio and Electronics Components Division, Upp. Thames St, E.C.4.*

POWER SUPPLY

Statistics for April

IN contrast to the considerable increase in electricity sent out by the Area Boards last month, this month's figures have settled down to the now fairly well established range of increases varying from 8% to 15%, although direct supplies by the CEGB show an increase of 16·1% on last year. The national figures show an increase over April last year of 9%. This is increased to 12·7% and is then comparable with previous months in the year if allowance is made for the number of effective working days and the average daily temperature during the month.

Only one new set was commissioned by the CEGB during the month. This was a 10 MW, MV turbo-alternator, the ninth to be brought into service at Spondon H (EM), where back-pressure turbines provide process steam for a local industry. The associated boiler also commissioned during the month is the twenty-fifth in the station. It has a capacity of 180 klb/hr and was built by Foster Wheeler.

Generation by the CEGB during the month totalled 8,437 million units, of which 7,931 million units was sent out for supply. The number of units generated rose during the year by nearly 9% while the corresponding rise in coal consumption to 3,529 thousand tons represents an increase of about 2·2%. Oil consumption also rose by 37·5% to 425 thousand tons. Generation by the NSHEB and the SSEB was 200 and 518 million units, respectively, with 213 million units of these totals being provided by hydro plant.

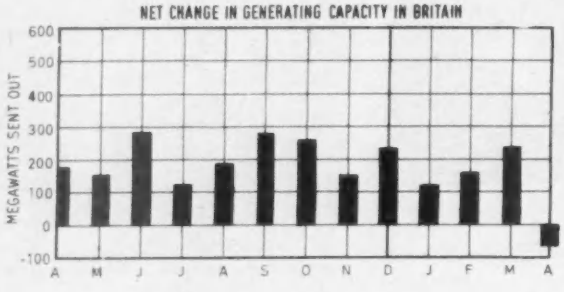
Total generation in the UK, therefore, amounted to 9,155 million units during the month, with 8,617 million units sent out to consumers. It is noteworthy that generation by industry amounted to 1,454·8 million units during the month. It is to be expected that a high proportion of industrial generation, actually 204·4 million units, comes from nuclear stations, but other chemical sources contribute a further 353 million units. Overall increase in generation by industry on April last year was 27%. This increase also allows for generation by transport undertakings amounting to 97·3 million units.

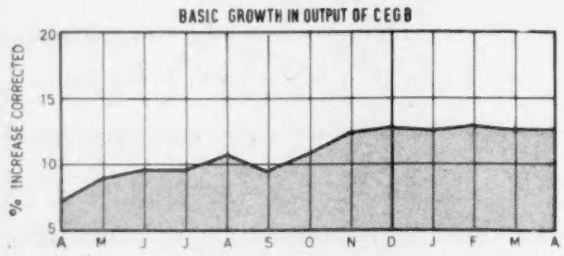
For the first time for over a year, the output capacity of the CEGB fell by 65 MW to 25,537 MW. Total installed capacity for the three boards for the month of April was 28,236 MW.

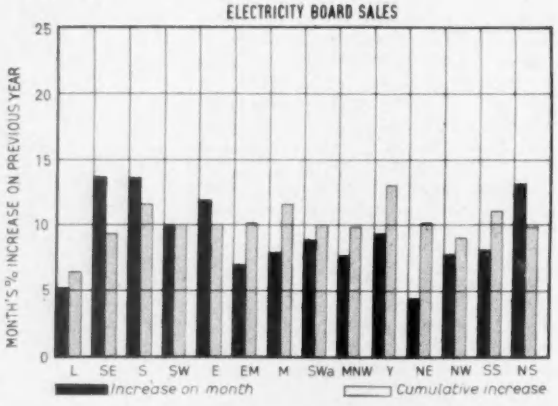
Electricity Board Sales Progress in April

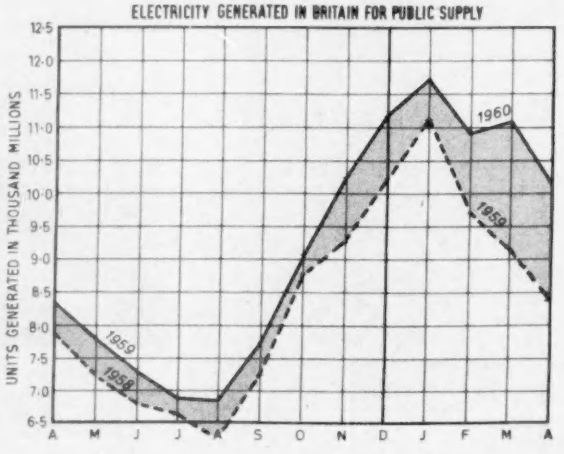
Board	Electricity sent out in millions of units	% increase on April 1959
London	683·5	5·1
South Eastern	501·0	13·7
Southern	658·9	13·6
South Western	308·7	9·9
Eastern	781·6	11·9
East Midlands	629·2	7·0
Midlands	851·2	8·0
South Wales	484·6	8·8
Merseyside and North Wales	497·3	7·7
Yorkshire	819·2	9·3
North Eastern	476·4	4·4
North Western	825·7	7·8
Direct supplies by CEGB	306·5	16·1
CEGB Total	7,823·8	9·1
South of Scotland	612·53	8·1
North of Scotland	140·54	13·1

Table excludes area board purchases from other sources.









News of the Week

NEW M.A.N.W.E.B. TARIFFS

Low rate attraction for big domestic users

A NEW domestic tariff, aimed at promoting more all-electric houses and a greater heating load, is being introduced along with an off-peak tariff which is available to all consumers by the Merseyside and North Wales Electricity Board. The off-peak rate is 0·9d per unit.

The new domestic tariff is, in effect, an adaptation of the existing two-block tariff. The size and price of the first block is unchanged, the secondary rate of 1·05d p.u. applies to the next 200 units per room and for all additional consumption the new low rate of 0·95d will apply.

These new proposals were considered by the area Electricity Consultative Council on Wednesday, when the date for its operation had to be agreed.

MANWEB have already reported a great expansion in sales of electricity and of electrical appliances during the year ended 31 March last, and the aim is to continue such progress. Unit sales in that year were nearly 9% up, and appliance sales topped £3¼ million, including 28,881 cookers and 22,675 water heaters. Sales of refrigerators more than doubled, while those for washing machines and vacuum cleaners increased by 65% and 35%, respectively. Value of h.p. transactions was £2,811,000—almost twice the 1958-59 figure!

At yesterday's Consultative Council meeting the board also indicated plans to follow Stage 5 of the rural electrification scheme. Of some 29,000 farms in the area, about 65% are already connected, and by the end of 1963 the percentage should increase to between 83% and 85%.

The board have also been asked to extend the present cooker maintenance agreement from five to seven years.

Lighter Loophole

THE reason why the definition of mechanical lighters was extended to include all portable lighters for Customs and Excise purposes in the last Budget was given in the House of Commons last week by the Economic Secretary to the Treasury (Mr Anthony Barber).

A new type of lighter has appeared, he stated, which does not produce either a spark or a flame, known as a "torch lighter." It has a dual-purpose battery which either lights an electric bulb, and so becomes a torch, or causes a small element to glow, and thus becomes a lighter outside the original definition. Although it is not being imported in any large quantity at present, it was thought desirable to close the loophole.

The date when the new definition takes effect is 4 Aug. next, to enable those holding stocks of the new type of lighter to dispose of them without duty in the meantime.

European Standard for Colour Coding Flexibles

AGREEMENT on a new European standard for the colour coding of flexibles in electrical appliances has now been reached, Mr J. C. Rodgers, Parliamentary Secretary to the Board of Trade stated in the House of Commons last week. European countries are being invited to amend their regulations so as to conform to this standard by 1 July, 1961.

F. D. Sims Acquired

THE copper wire manufacturing firm of F. D. Sims Ltd. has been acquired by Winterbottom Industries Ltd. for £382,330. Sims' average annual profit during the last three years was £57,000. The managing director, Mr K. O. Engel, and directors Mr F. Pithers and Mr D. Frearson, who have been with Sims since its start, continue on the board.

MOUCHEL MOVE

AFTER 60 years at 38 Victoria St, London, S.W.1, L. G. Mouchel and Partners, consulting civil engineers, are moving next month to new offices at Southbank Hse, Black Prince Rd, Albert Embankment, S.E.11 (Tel. Reliance 7691).

E.T.U. move postponed

IN their latest reply to the General Council of the TUC, the executive of the Electrical Trades Union indicated that they were prepared to accept an inquiry into alleged election malpractices provided it was carried out by someone in the trade union movement.

But when the reply was considered by the General Council this week the latter decided to postpone further action until the pending legal action against the union by two prominent members—Mr J. T. Byrne, Glasgow area secretary, and Mr F. Chapple, a member of the Executive—is concluded. Before the latter issued their writs the TUC had urged that an investigation be conducted by a person of judicial standing.

On Tuesday, Mr F. Chapple sought an interim injunction to restrain the ETU leaders from holding an election for assistant general secretary until a statement submitted by him was circulated to members.

B.I.C.C. unify sales forces

CHANGES in their marketing arrangements for rubber and thermoplastic insulated cables, to take effect from 1 June next, are announced by British Insulated Callender's Cables Ltd. From that date the home sales forces of Glovers, St. Helens, Metropolitan, Scottish, and Telcon will combine with the BICC home sales organisation and will sell a standard product presented on a standard drum or reel identified by the BICC group trade mark.

The blending together of the individual sales force will be done in such a way as to ensure that customers will receive the same personal service as in the past, BICC state. Additional BICC depots are being established in Bradford, Dudley and Portsmouth. All operations after 1 June will be based on BICC branch offices, to which all inquiries should be directed.

This new step is part of the BICC group's plans to reorganise both its cable production facilities and marketing arrangements, due to changes in the structure of the cable industry. It has been reported already that the factories of the Metropolitan Electric Cable and Construction Co. Ltd. and the St. Helens Cable and Rubber Co. Ltd. will cease production in the near future, and that their output will be concentrated at other factories within the group.

Chairman on Prices

The question of cable prices was referred to by Mr W. H. McFadzean, chairman of BICC, in the company's annual report presented at the a.g.m. last Tuesday. Although some severe falls in cable prices had since been partly made good, prices had not yet reached economic levels, he stated, and it would be some months yet before the new prices would apply to mains cables sold under annual contracts.

The most important single factor was whether the self discipline which several companies had imposed would be sustained. If so, then 1960, while not producing satisfactory results in the cable field, would witness the reintroduction of stability into the cable-making industry, on which one could build a more economic future.

'Fridge and Washer exports "disappointing"

says President of Board of Trade

BRITAIN'S export achievement in refrigerators and washing machines has been "disappointing," the President of the Board of Trade, Mr Reginald Maudling, admitted in the House of Commons last week. He was answering questions on the present "rather disturbing" increase in imports of these appliances, while British exports appeared to be lagging.

Mr Maudling produced figures (see table below) showing that the imports of domestic refrigerators, expressed as a percentage of exports, had risen from 2% in 1954 to 78% in 1959. Over the same period imports of washing machines had increased from a negligible amount to 90% of the export figure.

The total value of complete refrigerators exported fell from nearly £8 million in 1954 to just over £4 million in 1959, while washing machines decreased slightly from just over to just under £4½ million.

The industry was well aware of the Government's feelings in the matter, Mr Maudling pointed out, and it was now making vigorous efforts to try to improve its export record. There had, in fact, been a big increase in the import of manufactured goods generally since imports had been liberalised, but a balanced liberalisation of trade and manufactured goods had helped the UK. The inference was that British industry should be more competitive, he suggested.

Home Sales Boom

Meanwhile, sales of domestic refrigerators on the home market continue to boom, according to the latest figures issued by the Domestic Refrigeration Development Committee. In March home sales totalled 103,306, compared with 40,740 in the same month last year —an increase of more than 150%.

DorDec also report a gain of 44% in refrigerator exports during March, at the same time pointing out that, due to a change in the industry's method of calculating statistics, the figures for March and April (to come) may give a "somewhat too favourable impression."

But even making full allowance for that, they stress the increasing home market for refrigerators, and indicate the industry's determination to expand the overseas demand for its products.

Hong Kong Market

The importance of the price factor in establishing successful export markets is aptly indicated in a Board of Trade survey of refrigerator imports into Hong Kong published last week in a supplement to the Export Service Bulletin. Refrigerator imports into Hong Kong have doubled recently, reaching an annual total of 10,000 or more units a year. The popular size range is from 5 to 7 cu ft. Although the UK last year increased her sales of refrigerators in this market to 2,237 her share of the market declined from 31% to 20%. At present Italy and Japan are the principal suppliers to Hong Kong.

For refrigerators in the 5 to 7 cu ft range, the Bulletin quotes the following typical prices: USA—Frigidaire (7 cu ft) £78; Japan—National (5·6 cu ft) £56; Hitachi (5·6 cu ft) £62; Italy—Ambra (5·5 cu ft) £47, Rex-Zanussi (5·5 cu ft) £49; Germany—Liebherr (5·3 cu ft) £54, Bosch (5 cu ft) £55. The cheapest refrigerator of all is the Japanese 2 cu ft Hitachi which sells at £35. Significantly, no British prices are quoted at all.

Domestic Appliances (complete)	1954			1959		
	UK Imports £'000	UK Exports £'000	Imports as % of Exports	UK Imports £'000	UK Exports £'000	Imports as % of Exports
Refrigerators	184	7,806	2	3,169	4,025	78
Washing Machines	—	4,562	—	3,998	4,441	90

Exports and Imports of Refrigerators and Washing Machines in 1954 and 1959

Ever Ready in France

A SUBSTANTIAL interest in the Compagnie Industrielle des Piles Electriques, a French battery manufacturing concern, has been acquired by the Ever Ready Co. (Gt. Britain) Ltd., with the aim of mutually developing and expanding their respective battery interests in France and French overseas territories. This is the first move of its kind undertaken by Ever Ready, and results from the changing economic balance of Europe emerging from the formation of the Six and Seven trading groups.

Electric trucks: 2 to 1

TWICE as many electric trucks are used in British factories compared with other types of trucks, according to a survey recently carried out by the Electric Vehicle Association of Great Britain Ltd. This information is given in the annual report of the association presented at the twenty-sixth a.g.m. held in London last week.

The use of electric vehicles has increased steadily over the past ten years, the total in 1959 being 36,555, almost 50% more than the 24,386 used in 1950. Membership of the association now numbers 34.

At the meeting Sir Wavel Wakefield was re-elected president for the ensuing year. Details of other officers elected appear on page 852.

THOSE MARCH IMPORTS

In March, as we reported three weeks ago, UK imports of foreign domestic electric refrigerators reached the impressive value of nearly £1 million —more than our exports. In that month our principal suppliers were:

Country	Value £'000	% of Total
West Germany ...	407	44
Sweden	193	21
France	153	17
Italy	80	9
Switzerland ...	58	6

Other suppliers, making up the remaining 3% of the total, included Eire, Norway, Denmark, Netherlands, Luxembourg and the USA.

Imports of refrigerators from Common Market countries valued at £670,000 were 72% of the total, compared with £252,000 from EFTA countries, 27% of the total.

Six & Seven 'fridge talks

MEMBERS of the European Refrigeration Association, representing countries of both the Common Market and the European Free Trade Association, met in London last week to pool information on commercial practices, statistics, and technical standards in view of the greater exchange of refrigeration equipment taking place between European countries as "Six" and "Seven" trading plans develop. The meeting was organised by the British Refrigeration Association.

Pay claim for arbitration

AT the request of the unions concerned, the pay claim for manual workers in the electricity supply industry is to go to arbitration (as the employers' side offered earlier). This was agreed upon at the NJIC meeting last Thursday. Earlier, the employers' side had offered to re-examine the whole question of wages after the end of June, by which time it should be possible to assess the affect of the shorter working week, which has been in operation since February.

Cables for Portsmouth Dockyard

A CONTRACT for the supply, installation and jointing of some 4,700 yd of land cable and 8,500 yd of submarine cable, together with 5,500 yd of combined pilot and telephone cables, has been awarded to Pirelli-General Cable Works Ltd. by the Admiralty.

The cables, which are 33 kV, three-core, 0·3 sq in. oil-filled type, will be laid between Portsmouth dockyard and a Gosport substation. The submarine cable will be laid across Portsmouth harbour and the route will consist of both deep water and tidal mud flats.

CRABTREE TRIPLE POLE MINIATURE CIRCUIT BREAKERS

Maximum rating:
60 AMP. 500 VOLT A.C.

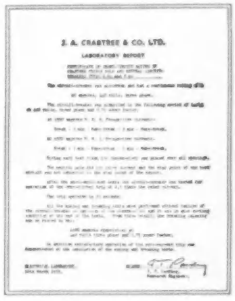
MAKING AND BREAKING CAPACITY TESTS

Repeated tests on this new circuit breaker have proved it to have a breaking capacity in excess of 5MVA. This corresponds to a breaking capacity in excess of 6,500 amp. R.M.S. at 440 volts. 3-phase 50 cycle (0·75 p.f.).

FLEXIBILITY OF USE

The standard unit is supplied in triple pole and neutral form, operation of the breaker isolating neutral as well as all three phases. It can, however, be supplied with an additional voltage- or current-operated trip to give remote or relay tripping in connection with manual or automatic control.

- **High certified making and breaking capacity.**
- **Close and accurate overload protection despite variations in ambient temperature.**
- **Flexibility in application. This unit is available as a triple pole and neutral miniature circuit breaker or earth-leakage circuit breaker (illustrated above); as master control with remote trip coil; as a triple pole miniature circuit breaker with remote or relay tripping.**
- **Elimination of single-phasing risk arising from one blown fuse. Overload on one pole of circuit breaker trips all main poles.**


J. A. CRABTREE & CO. LTD.
LABORATORY REPORT

- **Compact construction. This leads to a great reduction in the overall size of control panels, a 60 amp. triple pole and neutral main switch giving excellent overload and short circuit protection within an area of 7″ x 4½″ x 3½″.**
- **Sealed, tamperproof enclosure for mechanism.**
- **Simple, sturdy mechanism, unaffected by vibration.**
- **Easy "from-the-front" installation and wiring.**
- **Suitable for both flush or surface mounting.**
- **Available in distribution boards.**

Further details available on request

CRABTREE

J. A. CRABTREE & CO. LTD · LINCOLN WORKS · WALSALL

C.799.

Electrical Times, 26 May, 1960

Kingston By-Pass
near Shannon Corner

WE'RE IN THE PICTURE

Looking at this picture we feel we hardly dare confess to having a part in the manufacture of motor cars. None the less it is true. In fact we doubt if there is a car on the road to which we haven't contributed something.

For the thermostatic control of water temperature we make bimetal. For spark plugs we make alloys for centre and side electrodes. In automatic chokes, petrol gauges, and lamps again we play our part. We are specialists in the production of nickel-containing alloys. If you have a problem where you think we might help, do get in touch with us.

BRITISH DRIVER-HARRIS CO LTD NICHROME REGD TRADE MARK

CHEADLE HEATH, STOCKPORT, CHESHIRE

Dispute at Dalmarnock

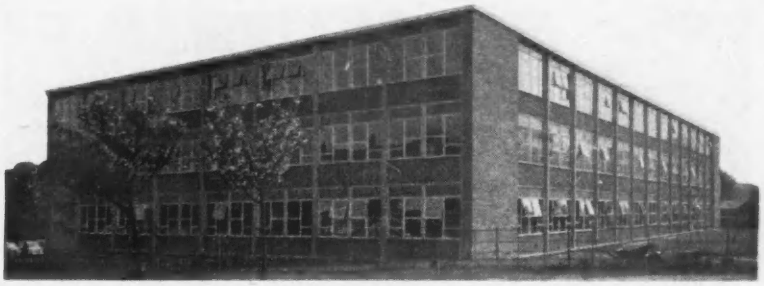
SOME 200 manual workers at Dalmarnock power station of the South of Scotland Electricity Board walked out on strike on Monday last week in protest against what they claimed to be wrongful dismissal of three men. The latter were dismissed for what the board termed "industrial misconduct"—they had been seen in a public house while officially on the sick list. Apart from those three, all the men returned to work two days later to allow negotiations to take place between the union and the management.

For the strikers it was said that "it was no concern of the management where men officially off sick chose to spend their time."

PHILIPS in GLASGOW

GLASGOW'S first major commercial building to be built since the war is to be taken over by Philips Electrical as their new Scottish Regional headquarters. Now under construction in the heart of the city, the seven-storey building is expected to be ready for occupation towards the end of the year. Facilities include electric floor-warming and electric points for shavers in washrooms.

In the new building Philips plan to centralise their Scottish activities, including radio and television, lighting, domestic appliances, stores and service dept.



New H.Q. for Midlands Project Group

THE new headquarters of the Midlands Project Group of the Central Electricity Generating Board, at 341 Bournville Lane, Birmingham 30, were formally opened last week by Sir Christopher Hinton, chairman of the CEGB, who unveiled a commemorative plaque in the presence of representatives of the contractors, quantity surveyors and staff of the Project Group.

The building, illustrated above, is a reinforced concrete structure three storeys high, designed by the Midlands Project Group. Inside there is a modular system of steel partitioning, and off-peak electric floor-warming is used throughout.

The group, under the control of Mr R. R. Maddock, chief project engineer, is one of three project groups set up by the CEGB two years ago for the purpose of constructing new power stations and associated works. At present the group is engaged on a number of major constructional works, including Staythorpe B, Willington B, Drakelow B, Drakelow C and Spondon H (East Midlands); Rugeley (West Midlands); Aberthaw and Uskmouth B (South Wales); and Sizewell nuclear power station in East Suffolk.

Ergonomics Conference

ERGONOMICS, the study of man in relation to his working environment, is the subject of a three-day conference to be held at the Connaught Rooms, Gt Queen St, London W.C.2, from 27 to 29 Sept. next.

Arranged by the Department of Scientific and Industrial Research, the conference is designed to bring recent ergonomic research to the notice of senior people in industry and show its applications in production engineering, equipment design, work study training and industrial health.

Speakers at the conference, representing industrial concerns, medical services, trade unions and academic institutions, will discuss the benefits to industry of a combined approach by anatomists, physiologists and psychologists, along with engineers, to problems of "fitting the job to the man."

The conference fee will probably be 15 gn. Details are available from Miss H. M. Clay, DSIR, 14-18 Cornwall Terr, Regents Pk, N.W.1.

SALTER—1760 to 1960

IN 1760 George III came to the throne, William Pitt was Prime Minister and Britain was at war with France. The industrial revolution was under way, but not yet at its peak. And in that year in a small house in Bilston, Staffs, Richard Salter, a spring maker, founded a family business which has grown from strength to strength through two centuries of accelerating industrial and technological progress.

Next month Geo. Salter and Co. Ltd. celebrate their bi-centenary, and for the record they have set down the fascinating history of the company in a 96-page well illustrated book complete with traditional family tree showing the firm's "pedigree" over the generations.

The book is entertainingly written by Miss Mary Bache, elder daughter of Mr E. W. Bache, former managing director of the firm and at one time chairman of the management committee of the BIF. It contains a wealth of historical detail and amusing anecdotes.

The company are famed for their springs and, in various applications, balances, weighing machines and automatic machines. Among odd products, some of which were made "to specification" are: a giant crossbow to hurl an acrobat 50 ft into the air; a "leg-puller" to draw the sinews out of poultry legs; a trouser stretcher; and tip-up seats for shop assistants.

Geo. Salter and Co. are to be congratulated on two centuries of successful trading—a forerunner, as all in the industry will wish, to many more centuries of progressive endeavour.

Bailee stole 'fridge: appeal dismissed

AN appeal by a former representative of the Broadmead Wireless Co. Ltd., who was convicted last January of larceny in respect of a refrigerator and radio receiver for which he was bailee, was dismissed at Bradford City Sessions last week. The appellant, Clifford Walter Wainwright, now detained in Leeds prison, had been given the refrigerator and radio with instructions to dispose of the goods on their behalf at retail prices of £68 6s and £21, respectively. Subsequently, he sold the goods for a total of £42 to a person who was later convicted of receiving the goods.

It was admitted that the appellant's intention throughout had been to keep the money for himself, but to constitute the offence of larceny by bailee it was suggested in appeal that the person to whom the goods had been entrusted, namely the bailee, must have done something inconsistent with the purposes of the bailment. Wainwright had been charged with the duty of selling the goods, and that was what he had done; his subsequent actions were not relevant.

The Court held that Wainwright had been entrusted with goods to be sold for the benefit of the company and sold at the price stated. Instead, he had sold the goods at his own price and for his own benefit. That, it was held, amounted to larceny by a bailee.

OFFICIAL PUBLICATIONS

ERA Report. "Soil Classification for Cable Engineers—ERA Simplified System," M. J. Vanner. 10s 6d (see page 858).

BS 2949. Rotating Electrical Machines for use in Ships. 8s 6d.

BS 3239. Determination of Resistivity of Metallic Electrical Conductor Materials. 5s.

National Institute for Research in Nuclear Science. UKAEA Report for 1958-9.

M-R CHAIRMAN ON

EXPORTS : MARKETING : PRICES

THERE are too many appeals and exhortations by the Government to industry, invariably conveying the implication that the manufacturer is failing in his duty to the nation. Such appeals only weaken his concentration on his proper job, which is to make his business as profitable as he can.

In these terms Mr F. B. Bishop, M.P., chairman of Morphy-Richards (pictured above), addressed members of the Incorporated Sales Managers' Association at their annual conference on "Efficiency in Marketing—Assignment of Responsibilities," held in Perthshire last week.

On the subject of exports, Mr Bishop pointed out that in normal conditions nothing helps exports more than a thriving home market. "When home sales are restricted the most likely effect is that sales managers will concentrate on trying to restore them, not in seeking alternative outlets abroad which cannot be quickly created anyway," he said.

"Lower production levels invariably mean higher costs, and that is particularly hard on the narrow export margins. So the general rule undoubtedly is that a squeeze at home will adversely affect exports, not help them, and this is a fact that industry should constantly emphasise to the Government. Figures show that exports *rise* in a time of expansion such as we have been enjoying. The trouble is that when expansion reaches a certain point imports tend to rise still faster, and that is where the threat to the balance of payments comes in."

The Government's true field of action lay not in exhortation and restriction of home sales, but in opening and keeping open the channels of international trade, Mr Bishop suggested.

Price policy followed the same pattern, with Governmental appeals to reduce prices, implying that industry was at fault in this respect. The important factor was long-term stability of prices in changing conditions.

Criticising resale price maintenance, Mr Bishop referred to a recent paper by Prof Yamey who estimated that its abolition would reduce retail prices by about 5%.

"It would be a mistake to make so drastic a change as the abolition of price maintenance at present," he went on. "It is too soon after the Restrictive Practices Act, the full effects of which are not yet apparent. I am doubtful whether it would lead to any general reduction in prices, whereas I am certain that it would have serious effects on the small independent retailer, whose reliance on a known margin on what he buys would be destroyed."

And a final comment: "Efficiency in marketing depends on many things, but in the last resort it must rest on sound policy in the boardroom. How can those in the field give of their best if they feel that policy at the top is confused with political issues that cut across the single-minded business concentration upon sales and more sales, and ever larger profits?"

Electrical Wholesaling in Europe

A DELEGATION from the Electrical Wholesalers' Federation attended the general assembly of the European Union of Electrical Wholesalers at Baden-Baden earlier this month to discuss matters of international policy in relation to electrical wholesaling. Among the British delegates were G. Conradi (president EWF), P. B. Etheridge (director), J. H. Hirst, H. Riley, B. Reynolds, N. S. Sellers, and Noel G. Smith.

£100,000 Furnace

A £100,000 induction melting furnace of one ton capacity is to be supplied to Jessop-Saville Ltd. by GEC in association with Vacuum Industrial Applications Ltd. and the British Geco Engineering Co. This is believed to be the largest furnace of its type being manufactured in the UK, and it is scheduled for installation in the company's Brightside works, Sheffield, by the end of the year.

The furnace, which will operate at 1,700° C, is designed for semi-continuous operation and has provision for casting under vacuum.

Cold Plate Bending at Erith

THE new Wagner three-roll cold plate bending machine just commissioned at the Erith Engineering Works of the GEC is believed to be the largest of its type in operation in this country. Weighing some 126 tons and valued at around £82,000, it is of German design and construction and is capable of bending mild steel plate up to 4½ in. thick.

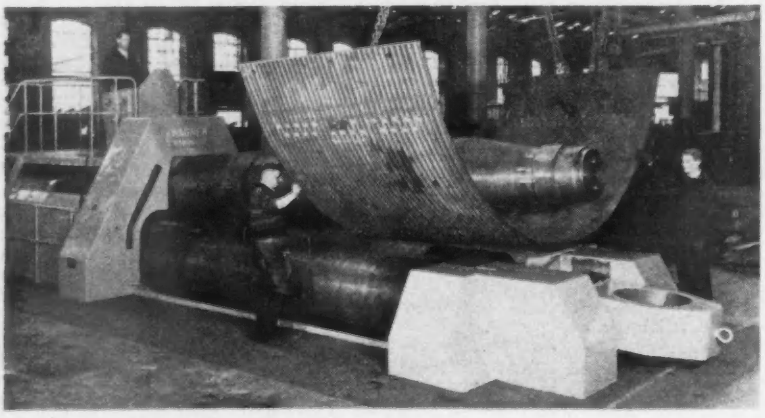
The machine comprises two bottom rolls, 2 ft 6½ in. in diameter, driven by a 167 h.p. motor through clutch and gear trains for bending against a third, or drop, roll mounted centrally above. The latter is supported at one end by a tilting bearing and at the other by a hinged bearing raised or lowered hydraulically by a 7 h.p. mechanism. This feature enables closed drums and cylinders to be rolled.

Both lower rolls are adjustable vertically, either together or individually, through gears driven by a 107 h.p. motor and this enables the radius of curvature to be adjusted while rolling and also allows for pre-bending at the ends without removal from the machine.

Pre-bending—the operation of bending the ends of a plate before insertion into the rolls—is effected by placing the plate in position between the three rolls and raising the lower ones together while the rolls are stationary. Provision is made to prevent free turning of the rolls during the operation.

Control and adjustment is effected from a raised platform overlooking the working area and the console includes meters for indicating power taken by the motors, monitors for showing the relative position of the bottom rolls, control switches and indicating lamps.

A 2,400 amp 3-phase main contactor is connected with safety interlocks to prevent any mal-operation. A central lubrication system and high-pressure greasing system are also incorporated together with a 525 lb/sq in. hydraulic system for operating clutches and oil cylinders for inclining the lower rolls and tilting the drop roll.



◀ *Cold plate bending—the removal of a rolled section necessitates the operation of the drop bearing and the tilting of the top roll as illustrated. The workpiece is a section of the shell of a 16 ft dia. double drum winder for installation in a British colliery. The mild steel plate is 6½ ft wide and 2 in. thick*

Insulators shot: Board offer reward

A REWARD of £5 is being offered by the South Eastern Electricity Board for information leading to the arrest of persons responsible for shooting at overhead power line insulators, which were so badly damaged last week that more than 15,000 consumers in the East Grinstead area suffered a five-hour power cut. Engineers found that 18 insulators had been damaged beyond repair on one tower, and some damaged on another.

An SEEB spokesman said that wilful damage of this kind occurred about half a dozen times a year, but not usually with such serious consequences. When children were involved, the board were reluctant to prosecute.

Boy with rifle

AT Stokesley, near Middlesbrough, the electricity supply was cut off after a 15-year-old boy shot at glass insulators on overhead power lines with a ·22 rifle. This was stated at Stokesley Juvenile Court last week when the boy was placed on probation for two years and fined a total of £6 10s after admitting to three charges of causing wilful damage with the rifle, using it without a licence, and receiving 500 rounds of ammunition knowing them to be stolen.

The electricity failure occurred on 6 April. Engineers of the local electricity board discovered that nine reinforced glass insulators had been broken on an 11 kV overhead power line.

Boys with catapults

ELEVEN insulators on an h.v. power pylon were damaged by boys using catapults, it was stated at Billericay Juvenile Court last week. The damage amounted to £28. Three boys, all aged 12, admitted causing malicious damage and were each conditionally discharged for 12 months. The parents were ordered to pay £7 each as compensation. An EEB official said the pylons carried power to the Chelmsford and Braintree areas. The action of the boys could have caused a power failure.

Atlas "Sylvalume" ceiling, 45 square yards in area, installed in the showroom of the Merseyside and North Wales Electricity Board's service centre at St. Helens, Lancs. The installation uses 22 8 ft 125 W fluorescent tubes, and is one of a large number of lighting installations carried out by the Manchester office of Atlas Lighting since it opened in Dec., 1958

New Rules for London's Pubs

THE LCC's Public Control Committee have reviewed licensing procedure with the aim of simplifying the rules of management applicable to smaller premises of entertainment. The committee have now submitted revised rules to replace over 100 existing rules for the management of premises such as hotels, restaurants, public houses, cafés, church halls and assembly halls licensed for public music or music and dancing.

Of lighting and electrical installations, the rules prohibit the use of portable cooking or heating appliances except where the council have given consent in writing. Any electricity-meter enclosure is to be used only for accommodating the meter and its connections and the area around the equipment, whether enclosed or not, is to be kept clear and unobstructed.

Essential lighting approved by the council is to be kept in operation, together with lighting of exit notices, whilst the public are on the premises, except where there is sufficient daylight in any part of the premises. All lampholders are to be kept fitted with lamps.

Unless the LCC decides otherwise, a certificate is to be provided by a qualified electrical engineer, at intervals not greater than three years, to show that the electrical installation has been examined and tested and is in a safe working condition.

For lighting systems which incorporate a battery, there are additional requirements that the battery must be fully charged before the public are admitted on any day and that the battery shall be under the supervision of a firm of battery manufacturers, who shall arrange for an examination and test at least once every six months. For floating batteries, the battery is to be discharged every month by taking its full load for its rated discharge period; for trickle-charge and stand-by batteries, at intervals to be determined by the council.

Power line shorted: youth charged

AN 18-year-old youth who was alleged to have short-circuited a 132 kV overhead power line by swinging a coil of wire was placed on probation for two years at Bilston last week for causing malicious damage amounting to £23. Fourteen engineers had to examine 132 pylons over a 15 mile route before they located the fault.

The youth, Colin Walton, of Coseley, who had been seen swinging a coil of wire near a pylon, said afterwards that it was an accident that he happened to hit the overhead line. People in the neighbourhood had been alarmed by a loud explosion and a brilliant flash. The barbed wire guard around the base of the pylon had melted.

Mr H. Whittaker, CEGB district engineer, said that the incident occurred fortunately on a Sunday afternoon, otherwise there would have been a complete power failure over a large area of the Black Country.

More Area Boards better?

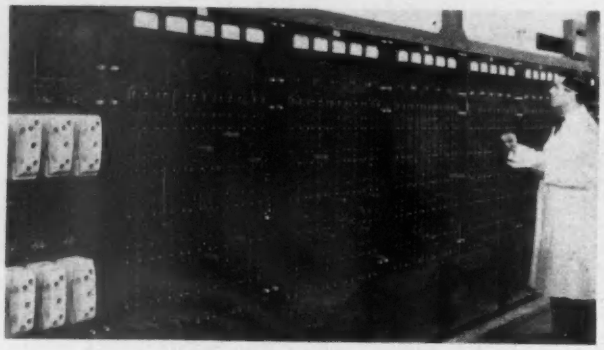
SMALLER geographical size for area boards, with more of them, might have produced more efficient and more manageable units in 1948. That is the opinion of Mr C. R. King, chairman of the Electricity Council. He says in a lecture to the Royal Society of Arts that based on experience, he thinks that 15 to 16 area boards for England and Wales, instead of the 12 organised, would have been preferable.

NUCLEAR SHIP PROGRESS

A TENDER for a nuclear-propelled tanker is to be submitted to the Ministry of Transport in July by English Electric, with the specialised assistance of Atomics International of USA. The proposal is for an organic moderated reactor which is claimed to be simple, reliable, safe and suitable for marine purposes.

Grants for Consumer Standards Work

FOR 1960-61 the British Standards Institution will receive a special grant of £10,000 from the Government towards the cost of its work for the domestic consumer, the President of the Board of Trade said in answer to a question in the House of Commons last week. In so far as the remaining cost of that work is not covered by subscriptions from associates of the Consumer's Advisory Council, it will be met from the general resources of the institution, to which the Government will this year contribute a grant of £160,000—larger than ever before.



The main d.c. supply board in the new Chloride research laboratories. A big 6,500 Ah battery floats on a 115 V mercury arc rectifier, and 6 V tappings can be connected via a distribution board to test benches at any voltage level

Chloride Battery Research Centre

THE new Central Research and Development Laboratories of the Chloride Electrical Storage Co, at Clifton, Swinton, Manchester, were opened last Friday by Mr A. W. Browne, chairman of the company, in the presence of representatives of local universities, technical colleges and scientific institutions.

Located on a nine-acre site, the laboratories are laid out in two units having a total floor area of over 41,500 sq ft. A two-storey building houses the administration section, library, conference room, and the chemical, electrochemical and metallurgical laboratories. The development departments and workshops are in a high single-storey building to the rear.

A d.c. supply for battery charging is obtained from a mercury-arc rectifier, while power for the test circuits is derived from a big Chloride battery with a capacity of 6,500 Ah floating on the mercury arc rectifier at 115 V. Tappings are taken at every three cells, each giving a nominal 6 V, and connections can be made via a distribution board to the test benches at any voltage level.

The laboratories have a staff of 180, including 40 qualified specialists, to carry out a programme of fundamental research into the many factors that influence the performance, output and life of all types of storage batteries and electrical storage systems.

Wholesale Take-over

IN a recent reorganisation Mansfield Factors (Electrical Supplies) Ltd., electrical and radio wholesalers operating in the East Midlands, have acquired the controlling interests in the following associated companies, which continue to operate as subsidiaries:

Electrical and Radio Factors, of Nottingham; Electrical and Radio Factors (Mansfield) Ltd., of Mansfield; Electrical and Radio Factors (Chesterfield) Ltd., of Chesterfield; Electrical and Radio Factors (Scunthorpe) Ltd., of Scunthorpe; and T. D. Young and Sons Ltd., Nottingham.

Mr Ralph Lowe is chairman and managing director of the group, whose head office is now at Regent Chambers, Clumber St, Mansfield. Mr W. E. Wright is the director responsible for group purchases at Mansfield. Local directors appointed are: J. D. Sperring (Chesterfield); F. M. Corker (Nottingham) and R. Purdy (Scunthorpe). Sales manager for the group is Mr G. F. King.

£830,000 Power Plan for Cornwall

THE South Western Electricity Board is investing over £830,000 this year to keep pace with development in Cornwall where the demand for power is now greater than ever. This was stated at Truro last week by Mr S. F. C. Whitmore, the board's deputy chairman, at the official opening of the reconstructed electricity service centre there by the Mayor of Truro, Councillor W. J. Bowden.

Mr Whitmore added that since 1948 nearly £9 million had been spent in extending and improving the electricity distribution system in Cornwall. There were now over 120,000 consumers on supply.

Last year electricity had been brought for the first time to nearly 3,550 consumers including some 500 farms, and the board's engineers had constructed nearly 190 miles of new mains and erected over 380 new substations. Capital cost of these engineering improvements totalled £940,000.

In all there were now nearly 6,800 farms in Cornwall connected to the mains (since 1948 electricity had been taken to approximately 4,650 farms) and this year the board planned to connect another 1,400 rural premises (including 540 farms) to the mains.

More Diesels for British Railways

ORDERS for another 190 main-line diesel electric locomotives worth some £15¼ million have been received by English Electric. The locomotives, which are part of the British Transport Commission's modernisation programme for the railways, are of three types. Quantities ordered are: type 1 (1,000 h.p.) 78; type 3 (1,750 h.p.) 37; type 4 (2,000 h.p.) 75. These are repeat orders for all three types of locomotive which will be built by English Electric at Preston, Newton-le-Willows and Darlington.

In addition, 21 diesel electric type 3 locomotives of the Birmingham-Sulzer-Crompton design have been ordered, making a total of 98 now being built for British Railways by the Birmingham Railway Carriage and Wagon Co. Ltd., for use in the Southern Region's Kent coast electrification scheme.

Fuel Abstracts Journal

THE first issue of a new monthly journal entitled *Fuel Abstracts and Current Titles* was published last week by the Institute of Fuel. Containing 112 pages, this pocket-sized journal sets out to cater for the fuel user who needs comprehensive information on scientific and technical literature available and abstracts of foreign language journals.

The journal is available on subscription of 12 gn a year (including index and postage) from the Institute at 18 Devonshire St, Portland Pl, W.1.

Ipswich and District Association A.G.M.

A SUCCESSFUL year, with a notable increase in membership, was reported by Mr J. A. Robertson, chairman of the Ipswich and District Electrical Association, at their annual general meeting last week. It was announced that Mr H. V. Pugh, chairman of the Eastern Electricity Board, had accepted the office of president of the association for the coming year.

FINANCE AND THE C.E.G.B.

THE electrical industry is healthy and thriving although its annual turnover amounts to only one-fifth of the value of its capital assets employed, suggested Mr Ernest Long, president of the Chartered Institute of Secretaries, at their annual conference, in reviewing the 12 years of public ownership. The industry's heavy capital requirements will amount to over £2,100 million for the seven-year period to 1965, and of this amount 48% will be provided by the industry itself.

Dealing with financial control within the CEGB, he said that all regions are subject to budgetary control but the regional committee can approve operational projects up to £50,000 and non-operational projects of £10,000. The committee cannot place a contract greater than £250,000 and larger capital schemes would not be handled by them.

In the case of the project groups a limit is set of £100,000; above that figure and up to £2 million contracts are reviewed by a panel of the three chief project engineers and still larger contracts come under the board itself. This delegation of authority is accompanied by certain in-built safeguards concerning communication to headquarters. In an industry spending large capital sums, research is essential and the board will shortly be spending £3 million to £4 million a year on providing new research facilities.

PHYSICAL UNITY

ON 17 May the Institute of Physics and the Physical Society were amalgamated in a new body named "The Institute of Physics and the Physical Society." The originating bodies are to be formally wound up and their assets handed over to the new one.

First president of the new organisation is Sir John Cockcroft. The four vice-presidents are Dr J. Topping, Dr W. H. Taylor, Prof R. W. Ditchburn and Mr A. J. Philpot. Other officers include Dr J. Taylor (hon. treasurer) and Dr C. G. Wynne (hon. secretary).

The Physical Society was formed in 1874 and the Institute of Physics in 1919. Headquarters of the new body are at 47 Belgrave Sq, S.W.1, and for the present offices will also be retained at 1 Lowther Gdns, S.W.7.

Oil Conversion Postponed

TWO coal-fired power stations—Brunswick Wharf and Littlebrook "B"—which were to have been converted to oil burning this year, will go on burning coal for at least two more years, the Minister of Power said in answer to a question in the Commons this week. The possibility of extending the period of the agreement is to be discussed before it ends.

Sayings OF THE WEEK

"Automatic data processing equipment [computers to you] *must cease to be a glamorous gadget or publicity gimmick and be designed and proved by thorough testing before marketing as a reliable working tool for serious people."* . . . J. W. FREEBODY at Electronics Symposium.

"The real function of efficient marketing is surely to produce and provide, not so much the article itself, but the complete use and enjoyment that it gives." . . . MR W. E. GRIST, at Incorporated Sales Managers' Association conference.

"Based on experience, I would say that more efficient and manageable units might have been established by reducing the size of individual boards and increasing the number from 12 to, say, 15 or 16." . . . Electricity Council chairman, MR C. R. KING, in a Royal Society of Arts lecture, commenting on organisation of the industry on nationalisation.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, May 24

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	248½	+4
" (3 months)	245½	+4½
LEAD, refined pig, 99·97% purity (cash)	78½	+⅞
" (3 months)	78	+1⅛
TIN, refined, min. 99·75% purity (settlement)	781½	−4
(3 months)	782½	−2½
ALUMINIUM, ingots 99-99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	218½	+4
SILVER (Troy oz)	79½d	—
ZINC, virgin, min. 98% purity (cash)	91½	−⅛
" (3 months)	91⅝	+⅛
RUBBER, per lb. No. 1, R.S.S. spot	39½d	−1½d
c.i.f. basis, ports, July	36d	−1½d
ARMOURING: Galv. Steel Wire (0·104 in.)	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES: Copper, electrolytic (per lb)	33c	—
Lead (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

Research into Space Heating

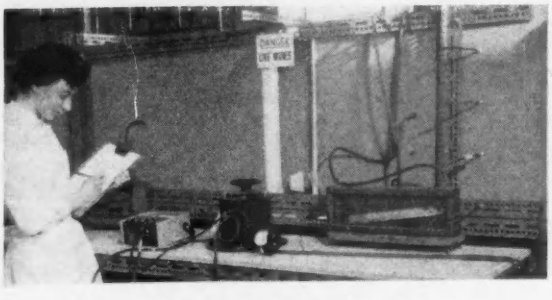
WHAT is claimed to be Britain's largest space heating research laboratory was recently opened at Colnbrook, Bucks, by Copperad Ltd., heating and ventilation equipment manufacturers. The laboratory investigates different aspects of heating and ventilating, from the durability of paint used on the company's products to the improvement of heat transfer coefficients under a variety of conditions.

An important aspect of the department's work is testing exhaustively new and existing appliances. Each month a unit is picked at random from the production line and given thermal tests to ensure it is capable of producing its catalogue rating within the specified tolerance. The sample is also dismantled and each part is inspected for imperfections.

Of interest is the climatic room, which is used for testing fan coolers and fan convectors. Cold air to cool the room is supplied by a 5 h.p. semi-hermetic refrigerating set. This set will also supply chilled water to a fan cooler under test in the room. Temperatures can be controlled between 30 and 140°F to within ±1°F, and relative humidity to within ±2% between 20 to 95% R.H. The room is thus able to simulate conditions in which fan coolers and convectors might be required to operate in any part of the world.

Another interesting device is a test platform for unit heaters (illustrated). It is constructed of perforated angle iron and is used for testing horizontal discharge unit heaters. For testing unit heaters against an added resistance an air volume test duct is used. Tests are made by measuring with a stroboscope the speed at which a fan rotates, by reading the resistance encountered on an inclined manometer, and air volumes with an anemometer or pitot head.

Other test equipment is used for checking steam or hot-water convectors, and there is a tensile test rig for testing fastening devices, spot welds, etc., to destruction.



Picture shows the test bench used for testing unit heaters against resistance encountered in an air volume test duct (seen in background). This is one section of Copperad's new space heating research laboratory, claimed to be the largest in Britain

Electricity in the Garden

A NEW, revised and largely rewritten edition of *Electricity in Your Garden* was published by EDA on Tuesday. This 48-page illustrated handbook surveys the many applications of electricity in modern horticultural practice, and is distributed free. Nearly half a million copies of earlier editions of the booklet have been distributed since the war.

News in Brief

A new automatic telephone exchange at Magherafelt was officially opened last week by Mr H. T. W. Millar, Director of the Post Office in N. Ireland.

A 40 MW milled peat power station at Rhode, Co. Offaly, has been put into operation by the Eire Electricity Supply Board.

Winner of the ETCTA Midlands golf tournament was Mr S. C. Tutton and runner-up, Mr A. D. Holmes.

Shetland County Council are to make representations to the Scottish Secretary to have electricity supplied to various parts of the islands, including the island of Whalsay, under the terms of the new Local Employment Act.

The first block of three ten-storey flats with electric floor-warming, built for Leeds Corporation at Holbeck, was officially opened by Mr Hugh Gaitskell last week.

London Transport is to complete conversion of all London trolley bus services to diesel bus operation by 1962.

Company Activities

WHATEVER the reason for Mr Khrushchev's act of Summit sabotage and whether or not it presages a warming up of the cold war, Stock Markets took a decidedly dim view. By mid-last week the renewed and gathering confidence which I noted in the last issue of the ELECTRICAL TIMES was rapidly evaporating. On Wall Street it was otherwise. Propelled by strong buying of defence issues the Dow Jones Ordinary index made a sixth-day successive rise to 623·0 (against a recent low of 599·1) with the share trading volume at its heaviest since autumn 1958. American sentiment therefore has prevented too great a toss in London.

Meanwhile, the flow of excellent company news continues to underwrite the fundamental strength and resilience of the market. A recent analysis embracing 855 public companies shows that industrial earnings and distributions have been increasing at a rising rate. How electrical and radio companies fared can be seen from 21 such companies which published their results in the first four months of 1960. The figures given are set against those reported in the first four months of last year. Profits of £46,880,000 compare with £43,591,000 and so represent an increase of 7·5%, while £16,387,000 was earned for the Ordinary dividends against £14,861,000, an increase of 10·3%. Ordinary dividends themselves had been stepped up from £6,780,000 to £8,115,000, representing an increase of no less than 19·7%.

But, again, last week came the ubiquitous Philips Lamps to demonstrate that it could do even better with its trading profit in the first three months of 1960. At fl.192 million (£18·8 million) they are up 33·4% on the first quarter of 1959, while the net profit at fl.187 million (8·2 million) is as much as 40% higher. And these figures were achieved on sales which are reported at 16% greater. In fact, trading profits now represent 18·4% of sales, against 16·1% for the first three months of 1959. Accordingly, the shares which had earlier eased to 175s rose to 182s 6d.

Associated Electrical Industries came to the market with an unchanged interim of 6d and despite the news of a £3½ million order for a new power station in Mexico with a capacity of 100 MW, dealers clipped 6d off the £1 Ordinary shares so that at 54s 3d the shares are now yielding a useful 5·5%.

AEI's one-third partner, John Thompson, in the AEI-John Thompson Nuclear Energy Co., however, fared even less well. Big in boilers for power stations as well as in marine work and heavy engineering their consolidated net profit sagged from £501,055 after tax to £324,311, while the Ordinary dividend was cut from 25% to 20%. Referring to the Berkeley nuclear power station, the project on which AEI last year set aside £750,000 to cover losses, the chairman tells us little new when he says that it is anticipated that ultimately there may be an overall loss on the contract. So, pending completion of the work, £500,000 has been set aside to a special nuclear contracts reserve. And down dropped the company's 5s Ordinary shares by 1s to 18s. At this level yield is 5·5% and for those with iron nerves could be bought as a "recovery" prospect now that the price is 7s 9d—30%—below its 1960 peak.—*From our City Correspondent.*

Automatic Telephone and Electric

Due to the reduction in the value of contracts received from the PO and the problems of rising costs and intense competition in world markets, both the turnover and the financial performance of the parent company were not as good as in 1958. But the subsidiary companies showed increased turnover and profitability, Sir Thomas Eades, the chairman, reports. The increasing application of modern communications type equipment in many other fields is providing markets which are expanding at a considerably greater rate than the telephone business. The bank overdraft at 31 Dec. last amounted to nearly £2½ million, and the directors have in mind at the appropriate time making a rights issue to Ordinary shareholders.

British Insulated Callender's Cables

Group sales totalled £128 million in 1959—some 30% representing exports from the UK and sales by overseas companies, Mr W. H. McFadzean, the chairman, reports. On the difficulties in the cable industry, he refers to recent moves, and emphasises that BICC—the largest cable making group—want their proper share of the market. The Mineral Insulated Cable Division will get further manufacturing capacity this year. British Copper Refiners had a throughput of some 80,000 tons, of which three-quarters was sold to customers outside the cable industry. The reconstruction of the Accessories Division is virtually complete and the recent acquisition of Electric Transmission Ltd. will enable the group to expand in that sphere. Mr McFadzean expects 1960 to be a difficult year, but is confident of the future.

British Thermostat Co.

After tax charge of £415,753 (*£429,919*), the net profit for the year to 31 Jan. last is £396,581 (*£441,160*). A final dividend of 9d makes a total of 1s per 5s Ordinary share, compared with the equivalent of 10½d last time.

T. Clarke and Co.

Mr H. Evans, the chairman, considers it reasonable to expect that profits will be higher in 1960 than in 1959. When the Edmundsons Construction Co. was acquired on 1 April, it was expected that T. Clarke would make a profit of £20,000 for 1960. But now there is every reason to believe that this figure will be exceeded, he states.

Drayton Regulator and Instrument Co.

To provide additional productive capacity required for the various subsidiaries, another factory at West Drayton is being purchased for £125,000. These premises will require adaptation, but it is anticipated that they will be taken over toward the end of the year. It is also expected that substantial finance will be needed to carry out all the projects planned, but Mr P. H. Lloyd, the chairman, states that the time for such an operation is not yet ripe.

Garrard Engineering and Mnfg.

Net profit, after tax, for the year to 31 Jan. last dropped to £146,975 (*£281,128*). A final dividend of 6% makes the total 10% on increased capital, against the equivalent of 12% last time.

Phoenix Telephone and Electric Holdings

Although the audit for the year ended 29 Feb. last has not yet been completed, it is certain that a very substantial trading loss was incurred, the board state. There is no half-yearly dividend on the Preference shares. (In the previous year a loss of £1,745 was incurred.)

Southern Areas Electric Corpn.

In amplification of the better results for 1959 (reported last week) Lord Gridley, the chairman, states that if the increased rate of new business obtained in recent months is sustained, profits for 1960 should at least suffice to maintain the dividend rate. The overdraft has since been further reduced to £135,500.

Telephone Manufacturing Co.

Operations in 1959 resulted in a group loss of £1,059, after tax charge of £57,427 (*£59,059*), compared with a profit of £67,316 in the previous year. Final dividend is halved to 5%.

Telephone Rentals Ltd.

The amount of new business during 1959 was again a record, in spite of increased competition, Mr W. Stuart Philcox, the chairman, reports. The sudden and to some extent unforeseen uprising in the business in the middle of 1959 had the double effect of running down stocks and lengthening the delivery period from the principal suppliers.

John Thompson

Group profit for 1959 dropped to £1,331,642 from the previous year's figure of £1,742,336. Dividend is also cut 5% to a total of 20% with a final of 12½%.

Dividend Declared

Associated Electrical Industries. Interim dividend 2½% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

27 May—Cardiff C.C. Electrical installation on fixed price basis in proposed Subdivisional Police Station, Ely.—See 19 May issue.

27 May—Gateshead C.B. Electrical installation in Stage III Gateshead Technical College. Applications giving details of recent similar size work to Borough Architect, Swinburne St, Gateshead 8, by above date. Deposit £3, made payable to Borough Treasurer.

27 May—Larne B.C. Electrical installations in four shops and maisonnettes on Antiville site.—See 19 May issue.

30 May—Cornwall C.C. (b) Provision of electrical services, on fixed-price basis, at St. Michael's Home for Old Persons. Applications to Architects, Cowell, Drewitt and Wheatley, Lloyds Bank Chmbrs, Penzance, by above date.

30 May—Hastings T.C. Electrical installations, on fixed-price basis, in five-storey block of flats and maisonnettes in Gensing Rd, St. Leonard's-on-Sea. Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

30 May—Liverpool C.C. Supply of domestic electrical appliances. Central Purchasing Officer, New Oxford Hse, 75 Dale St, Liverpool 2.

30 May—Renfrew C.C. Electrical installation in Mearns Primary School, Newton Mearns, alterations and modifications. Applications to County Clerk, R. Urquhart, County Bldgs, Paisley, by above date.

30 May—Rowley Regis B.C. Supply and erection of 15 Group "A" and 430 Group "B" units on concrete columns for 1960/61 programme. Borough Engineer and Surveyor, S. G. Wood, Municipal Bldgs, Old Hill, Staffs. Deposit £2.

30 May—Stepney B.C. Two passenger lifts for nine-storey block of flats.—Advertised 19 May issue.

30 May—Worsley U.D.C. (a) Electrical installations in 223 and 68 dwellings, Little Hulton. Applications to Clerk and Solicitor, R. E. Huband, Town Hall, Walkden, Manchester, by above date.

31 May—Cardiff C.C. Electrical installations, on fixed price basis, in two playrooms at Preswylfa Occupational Training Centre, Canton.—See 19 May issue.

31 May—Ealing B.C. Contract A: Supply of 41 140 W sodium lanterns, lamps and gear. Contract B: Supply and erection of 41 25 ft steel columns.—Advertised 5 May issue.

31 May—Glasgow C.C. Supply of v.i.r. and p.v.c. cables, dry cells and lamps for year. Applications to General Manager, Transport Dept., 46 Bath St, Glasgow C.2, by above date.

31 May—Hetton U.D.C. Supply of (Item 10) electrical equipment and (Item 16) lamps for year.—See 19 May issue.

31 May—Kilrenny T.C. Electrical work in erection of 18 houses at Milton Cres, Anstruther Wester. Applications to architects: James Gillespie and Scott, 4 Queen's Gdns, St. Andrews, by above date.

31 May—Lytham St. Annes B.C. Supply, erection and wiring of 87 Group "A" and 44 Group "B" "Stanton" concrete columns complete with control gear plus the removal of 113 existing columns.—See 12 May issue.

31 May—Wanstead and Woodford B.C. Installation of 685 Groups "A" and "B" lighting units of various types in 120 roads.—Advertised 12 May issue.

1 June—Ayr C.C. Supply of lamps. County Clerk, Supplies Dept., County Bldgs, Ayr.

1 June—Birmingham C.C. (a) Electrical installation, on fixed-price basis, at Industrial Research Laboratories, Holliday St. Documents from and deposit £2 2s made payable to City Engineer and Surveyor, Sir Herbert J. Manzoni, Civic Centre.

1 June—Cardiff T.C. Fixed price tenders from N.I.C.E.I.C. contractors for electrical installations in 15 existing houses. City Surveyor, City Hall. Deposit £2 2s.

1 June—Kingston upon Hull C.C. Electrical installations in 36 dwellings, Bricknell Ave estate and Warneford Gdns. Documents available on deposit of £2 with City Treasurer.

1 June—Leeds (Group B). Supply of electrical goods. Supplies Officer, Hospital Management Committee, Seacroft Hospital, Leeds 14.

1 June—Luton B.C. Electrical work in connection with new heating installation at Dunstable Rd Primary Schools.—See 12 May issue.

1 June—Manchester C.C. Supply of cubicle type switchboard for new Courts of Law. City Architect, P.O. Box 488, Town Hall.

2 June—Armagh. Electrical installations in 40 dwellings, Callan St.—See 19 May issue.

2 June—Belfast. Electrical installations in extensions and new meals servery at St. Peter's Voluntary Primary School, Raglan St.—See 19 May issue.

2 June—Belfast T.C. (1) Additions to installation at Graymount Secondary School for Girls, Gray's La; (2) Electrical installation at Blythefield Junior Primary School, Blythe St. Education Architect's Dept., 40 Academy St.

3 June—Bognor Regis U.D.C. Supply and erection of 174 Stanton, Concrete Utilities and G.E.C. columns; supply, fitting and wiring of G.E.C. fluorescent lanterns complete with auxiliary gear plus removal of existing installations.—See 19 May issue.

3 June—Notts C.C. Supply and erection of 10 steel columns, lanterns and gear on A1 at Hawk's Nest, Bawtry.—Advertised 12 May issue.

3 June—Rothwell U.D.C. Provision and erection of 494 Group "B" 45 W lighting on reinforced or prestressed concrete columns. Engineer and Surveyor, Civic Bldgs. Deposit £2 2s.

7 June—Belfast. Electrical and mechanical services installations in new club-house and changing-rooms, Stockman's La, for Instonians R.F.A. Details from consulting engineers, M'Candless and Barton, 6 Murray St, Belfast. £3 3s.

7 June—Ripley U.D.C. Installation of sodium discharge lighting along Cromford and Heabe roads. Surveyor, H. Hiller, Town Hall. Deposit £1.

7 June—Sligo C.C. Supply and erection of 128 g.p.m. at a 142 ft head pumping plant at Lower Rosses.—See 12 May issue.

7 June—Wallasey C.B. Electrical installation in Egerton Grove School extensions and additions. Borough Architect, Town Hall, Wallasey.—Advertised in this issue.

8 June—Dunbartonshire. Electrical installation in N.A.T.O. Common Infrastructure Slice VI Naval Base installations storage facilities. Applications to Director-General, Navy Wks, Admiralty, Chamberlain Way, Pinner, Middx, by above date.

8 June—Ormskirk U.D.C. Supply and erection of 28 Class "A" and 67 Class "B" concrete columns, lanterns, sodium lamps and gear. Surveyor, Council Offices, Burscough St.—Advertised in this issue.

8 June—Winchester C.C. Erection complete of 50 25 ft steel and 16 ft c.i. columns for 250 W, 120 W and 80 W colour corrected m.v. lighting along A31 and C461.—See 19 May issue.

9 June—Liverpool Hospital Management Committee. Provision of new road lighting at Sefton General Hospital.—See 19 May issue.

10 June—Aldridge U.D.C. Erection of: (1) 12 Group "A" and 44 Group "B" reinforced concrete columns and supply/erection of 12 140 W and 19 60 W sodium lanterns and gear and 25 100 W tungsten lamps, lanterns; (2) 43 Group "B" columns plus supply/erection of 35 60 W sodium lanterns/gear and eight 100 W tungsten lamps/lanterns on fixed price basis.—See 12 May issue.

10 June—Inverness C.C. Installation of street lighting including trunk road lighting at Newtonmore and Carrbridge. Applications to County Clerk, County Bldgs, Inverness, by above date.

10 June—Stamford. Erection and installation of 32 Group "A" mercury lighting units on steel columns, together with two illuminated bollards for A1. Stamford By-pass roundabout lighting for M. of Transport. Details from consulting engineers: Stirling, Maynard and Partners, 8 Station Chmbrs, Peterborough. Deposit £2 2s.—Advertised in this issue.

11 June—Bournemouth C.B. Electrical installations in: (1) Hill View Rd Junior School; (2) Summerbee Junior School, East

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 108 queries answered this week

"Ticino" switchgear—agents for? L.E.B.—Sams Electric London Ltd., 9 Tabernacle St, E.C.2.

"Ignis" refrigerators — suppliers of? M.R.—Hobday Brothers Ltd., Great Eastern St, E.C.2.

Paton Bros. Engineer Service—address for? T.A.—15 St. James Row, Sheffield 1.

"Rayovac" batteries — suppliers of? E.C.R.E.F. — Alpha Accessories Ltd., Caemawr Factory, Treorchy, Rhondda, Glam, Wales.

"Welbeck" industrial vacuum cleaners—makers of? O.G.E.—New Welbeck Ltd., Moulsecoomb Way, Brighton 7, Sussex.

"F. and E." Jones type plugs—makers of? T.E.—Films and Equipment Ltd., 138 Wardour St, W.1.

Self-winding cable drums—makers of? H.P.—Deco Engrg. Co. Ltd., West Row, W.10; Metropolitan Tool and Products Ltd., 21 Victoria St, Nottingham; Power House Components Ltd., Wayne Hse, Regent St, Nottingham; Sturge and Co., 37 Sheepcote St, Birmingham 15.

"Multiminor" portable testing instrument — makers of? C.W. — Avo Ltd., "Avocet" Hse, 92/96 Vauxhall Bridge Rd, S.W.1.

Way; (3) Kinson Junior School; (4) East Howe Boys' and Girls' Secondary School, Hadow Rd; (5) Stourfield Mixed Secondary School, Beaufort Rd. Borough Architect's Office (Room 106), Town Hall. Deposit £2 2s.

11 June—Chesham U.D.C. Supply and erection of 49 Group "A" steel columns with 250 W colour corrected m.v. lanterns together with 24 Group "B" columns with 125 W m.v. lanterns with all lamps and control gear.—Advertised 19 May issue.

11 June—Havant and Waterloo U.D.C. Supply of (Item 14) cables and fittings for year to 31 July, 1961. Engineer and Surveyor, 1 Park Rd North, Havant.

13 June—Brighton C.B. Electrical installation, on fixed-price basis, at Teachers' Training College, 1 and 2 Percival Terr. Borough Surveyor, Engineer and Planning Officer, 26/30 King's Rd. Deposit £1 1s.

13 June—Co. Antrim. Electrical installation in new pig progeny testing station at Greenmount Agricultural College estate, Muckamore, for M. of Finance. Room 103, Law Courts Bldg, Belfast 1. Preference given to firms on King's National Roll.

13 June—Manchester C.C. Electrical installations in shops, maisonnettes and garages, Peel Hall neighbourhood unit. City Architect, P.O. Box 488, Town Hall.

14 June—Co. Antrim. Provision of electrical engineering services in new boilerhouse, Hopefield Hospital, Portrush, for Hospital Management Committee. Details from consulting engineers, W. and M. Given, 1 Waterside, Coleraine. Deposit £2 2s.

16 June—Fylde Water Board. Electrical installation in Head Offices, Blackpool. Board Engineer, Sefton St, Blackpool.—Advertised in this issue.

16 June—Llanfrechfa Lower P.C. Supply and erection of 49 Group "A" steel columns with 140 W sodium lanterns, ancillary gear and underground cabling. Alternatively: 38 35 ft steel columns with 200 W sodium lanterns for A4042 lighting at Croesyceiliog.—See 19 May issue.

17 June—Down C.C. (a) Electric lighting and heating installation at new child health clinic, Park Ave, Newcastle. Details from consulting engineers, Barrett and Agnew, 420 Ravenhill Rd, Belfast. Deposit £3 3s.

22 June—Stockport B.C. Electrical installation in "Newlands," Aged Persons' Home.—See 12 May issue.

28 June—Manchester C.C. Supply and erection of 415 V cables and auxiliary equipment for secondary sludge treatment plant at Davyhulme Sewage Wks extensions. City Surveyor, Town Hall, Manchester 2.—Advertised in this issue.

No date stated—Haddington T.C. (7) Electrical installation separate trade contract in erection of 20 houses at Artillery Pk site. Applications to Surveyor, R. T. B. Gilray, 60 Castle St, Edinburgh.

CONTRACTS PLACED

C.E.G.B. Contracts placed during the past two months, amounting in the aggregate to approximately £7,127,000, include: Blyth "B" power station: superstructures for main and ancillary buildings and turbo-alternator blocks, Mitchell Construction Co. Ltd.; circulating water pumps and pumphouse equipment, Gwynnes Pumps Ltd.; circulating water civil works and other external work, Sir Robert McAlpine and Sons Ltd. Thorpe Marsh power station: three 4,800,000 g.p.h. natural draught cooling towers, Film Cooling Towers (1925) Ltd.; booster pumps and starting and standby boiler feed pumps, G. and J. Weir Ltd.; 275 kV switchgear and ancillary apparatus, A.E.I. Ltd.; 11 kV switchgear and accessories, A. Reyrolle and Co. Ltd. Skelton Grange "B" power station: canal-borne coal wharf and coaling plant foundations, The Mitchell Construction Co. Ltd. Padiham "B" power station: main auxiliary control and instrument cables, London Electricity Board. Drakelow "C" power station: booster pumps and starting and standby boiler feed pumps for Nos. 9 and 10 (350 MW) sets, The Harland Engineering Co. Ltd.; preliminary site works, M. J. Gleeson (Contractors) Ltd. Aberthaw power station: circulating water pumps and equipment, Gwynnes Pumps Ltd. Rugeley power station: 3·3 kV air-break switchgear, A.E.I. Ltd. West Thurrock power station: boiler make-up water treatment plant, John Thompson Kennicott Ltd. Wolverhampton power station: 33 kV switchgear, South Wales Switchgear Ltd. Sundon substation: three 180 MVA, 275/132 kV auto-transformers, Crompton Parkinson Ltd. Bootle substation: two 60 MVA, 132/33 kV transformers, English Electric Co. Ltd. Kirkby substation: two 60 MVA, 132/33 kV transformers, Yorkshire Electric Transformer Co. Ltd. Salisbury substation: two 60 MVA, 132/33 kV transformers, Yorkshire Electric Transformer Co. Ltd. Peterborough substation: two 60 MVA, 132/33 kV transformers, C. A. Parsons and Co. Ltd. Christchurch substation: one 45 MVA, 132/33 kV transformer, Fuller Electric Ltd. Blyth power station: 275 kV switchgear, A. Reyrolle and Co. Ltd. Connah's Quay substation: 132 kV switchgear, A.E.I. Ltd. Drakelow substation: 275 kV overhead line diversion, Watshams Ltd. Taunton-Exeter: 275 kV double-circuit o/h line, British Insulated Callender's Cables Ltd. Keadby-Wold Newton: 132 kV double-circuit o/h line, British Insulated Callender's Cables Ltd. Richborough-Thanet and Canterbury: 132 kV double-circuit o/h lines, Riley and Neate Ltd. Stalybridge substation: 132 kV cables, Pirelli-General Cable Works Ltd.

C.E.G.B. (E. London and S.E. Region). Contracts placed during March and April over £5,000 in value: Littlebrook "C" P/Station, shunt de-aerating equipment, Hick Hargreaves Ltd., £23,705; Walthamstow S/Station, 66 kV isolating switches, A.E.I. Ltd., £12,920; Leatherhead S/Station, 33 kV switchgear, Cooke and Ferguson Ltd., £8,762; Leatherhead S/Station, site-works (civil), G. T. Crouch Ltd., £5,514; Leatherhead S/Station, 132 kV switchgear, English Electric Co. Ltd., £5,418; Ruckinge S/Station, 132 kV main connections, English Electric Co. Ltd., £26,666; Ruckinge/Dungeness, 33 kV wood pole line and 132 kV line modifications, Clough Smith and Co., £20,912; Basildon S/Station, civil works, J. L. Eve Construction Co., £6,097; Wymondley/Letchworth and Cliff Quay/Sundon, 132 kV overhead line and modifications, B.I.C.C. Ltd., £40,591; Peterborough, 132 kV overhead line diversion, Watshams Ltd., £6,235; Peterborough S/Station, two 60 MVA 132/33 kV transformers, C. A. Parsons Ltd., £124,907; Deptford East P/Station, coal gang locker block, Fredk. Smith, £10,573; Willesden S/Station, 132 kV switchgear modifications, Reyrolle Ltd., £5,971; Leatherhead S/Station, 132 kV and 33 kV cables, B.I.C.C. Ltd., £9,910; Sittingbourne S/Station, 132 kV and 33 kV cables, Pirelli-General Ltd., £5,622.

Durham C.C. Electrical installations in: second instalment, Consett Fire Station, £1,530; housecraft room, Hunwick Modern School, £281; renewal at Craghead Infant School, £322, North of England Engineering and Electrical Co.

London C.C. Electrical work in Nanhurst Residential Nursery, Cranleigh, Buchanan and Curwen Ltd., £3,818; renewal of electrical installation at Lee Manor Primary and Day Special School, Reid and Barrow Ltd., £3,207; electrical installations on Becontree estate, Essex and Downham estate, F. J. Baynes and Co. Ltd., £10,143, £8,759, £12,106, £12,124 and £16,341.

Newcastle-on-Tyne Hospital Board. Electrical work: in kitchen extensions at Newcastle General Hospital, J. Scott and Co. Ltd., £1,906; and in new X-ray dept. at Shotley Bridge Hospital, Veale Nixon Ltd., £1,025.

TRADE NOTES

Change of Address. Electrical Appliances (Glasgow) Ltd. have moved to 31 Argyle St, Glasgow C.1. Telephone: City 3777.

Change of Telephone Nos. As from 1 June, the telephone number of the BICC Liverpool branch will be Maritime 2424. From 11 June, the telephone number of the BICC Dundee branch will be Dundee 25726/7.

Factory Purchase. Joseph Lucas (Industries) Ltd. have bought two factories at Bromborough from Metal Industries Ltd. for £20,000. These factories were originally acquired by M.I. to house Brookhirst Switchgear Ltd., but due to a change in the administration this plan fell through.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

10 June—India. 141 transformers from 50 to 1,000 kVA. Stores Purchase Officer, Rajasthan State Electricity Board, Power Hse, Jaipur. B.o.T. (ESB/12943/60).*

12 June—Iraq. Electric wires. Iraqi Ports Administration, Basrah. B.o.T. (ESB/12982/60).*

12 June—Kuwait. Two m.v. 3-ph. substation distribution boards for Sabah Hospital. Dept. of Electricity, Water and Gas, Government of Kuwait. B.o.T. (ESB/12923/60).*

13 June—New Zealand. 62,730 ft (41 drums) telephone cables. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/12946/60).*

14 June—Sudan. A.C. motors. Controller of Stores, Sudan Railway, Atbara. B.o.T. (ESB/12439/60).*

15 June—Kuwait. 11 kV o/h line equipment including: insulators, cross arms, stay rods, switchgear and wood poles. Dept. of Electricity, Water and Gas, Government of Kuwait. B.o.T. (ESB/13259/60).*

16 June—Australia. 4,700 ft 11 kV and 2,100 ft 650 V p.i.l.c.s.w.a. cable for Shortland County Council, Newcastle, N.S.W. B.o.T. (ESB/12483/60).*

17 June—S. Africa. Six P.B.X. switchboards. Town Clerk, City Hall, West St, Durban. B.o.T. (ESB/12625/60).*

20 June—Sudan. Submarine cables. Controller of Stores, Sudan Railways, Atbara. B.o.T. (ESB/12440/60).*

20 June—Trinidad and Tobago. Power transformers. Purchasing Officer, Electricity Commission, P.O. Box 121, Port of Spain.—Advertised in this issue.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

a in circle design. 798,335. Class 9. Automatic temperature regulators, etc. British Arca Regulators Ltd., Sisson Rd, Gloucester.

Airmaster and **Speedmaster.** B799,616/7. Class 7. Electrically and pneumatically operated hand guided tools. Selectra Power Tools Ltd., Victoria Wks, Victoria Rd, N.W.10.

Electrux. 799,376. Class 11. Refrigerators, etc. Electrolux Ltd., Electrolux Wks, Oakley Rd, Luton, Beds.

Fablite. 793,925. Class 11. Lampshades, lighting fittings, etc. Fablite Ltd., 13-17 East Dulwich Rd, S.E. 22.

Spectophon. B790,563. Class 9. Apparatus, etc. Symphony Amplifiers Ltd., 42 Tottenham St, W.1.

Sterophoner. B790,184. Class 9. Radio electronic apparatus, etc. Symphony Amplifiers Ltd., 42 Tottenham St, W.1.

Wella. 800,257. Class 7. Hair drying appliances. Wella Rapid Ltd., 8 Eden St, N.W.1.

BUSINESS PROSPECTS

Angus C.C. Tender: New Seaton Rd, Arbroath, Junior Sec. School. Architect.

Belfast. Hospital Management Comm. plan £500,000 theatre and radiology block.

Berwick. Newcastle Regional Hospital Board plan £60,000 Berwick Infirmary extensions.

Birkenhead. Fibreglass Ltd. plan Valley Rd factory.

Birmingham T.C. Tender: 10 shops, 12 dwellings, Wyreley Birch estate. Architect.

Blyth T.C. 52 houses, Newsham Rd, planned. Engineer.

Bodmin B.C. Tender: 18 Trelawney Rd bungalows. Surveyor.

Bolton. Thynne Engineers, 33 Thynne St, plan extension of premises.

Bournemouth. Geens and Cross, Metropole Chmbrs, The Lansdowne, architects for Christchurch Rd offices and flats.

Bracknell. Ferranti Ltd., Westwick, Bagshot Rd plan Western Rd factory.—Development Corpn. plan five factories.

Brighton. Geo. Wimpey, Hammersmith Gr, W.6, to demolish Montpelier Hotel and erect block of flats on the site.

Bury. Manchester Regional Hospital Board plan General Hospital operating theatre.

Cambridge. L. A. Culliford and Ptners, 47 Essex St, W.C.2, architects for Cambridge Daily News (1929) printing works.

Cardiff. Rover Car Co., Meteor Wks, Lode La, Solihull, Birmingham, plan Pengam Moor airport site for factory.

Chailey. Ringmer Buildings Wks Ltd., Ringmer, near Lewes, contractors for Chailey Heritage admission villa. £47,000.

Chesterfield. Sheffield Regional Board plan 650-bed Ashgate hospital.

Clogher R.D.C. Tender: 36 Fivemiletown houses, six Aughnacloy. E. C. Harris and Ptnrs, Ulster Bldgs, Crumlin Rd, Belfast, quantity surveyors.

Co. Antrim. East Antrim Hosp. Management Comm. plan £100,000 Moyle Hospital block.

Coleraine. Ulster Chipboard, Castleroe, plan £40,000 extensions.

Crawley. G. Corderoy and Co., 2 Caxton St, S.W.1, quantity surveyors for £250,000 offices scheme, Manor Royal, for Building and Civil Engineering Holidays Management.

Croydon B.C. Welfare Comm. plan £65,000 Monk's Hill home for the aged.

Darlington T.C. 200 Branksome estate houses planned.

Dawley. Hinkshay Rd factory extensions planned by Ever Ready Co. (Great Britain).

Derbyshire C.C. £58,000 Clowne home for aged planned.

Doncaster. British Ropes plan £100,000 three-storey block behind Warmsworth Hall.

Dudley. Corpn. Welfare Comm. plan £163,800 blind workshops.

Durham C.C. Tender: Stage 2, Easington Technical College. Architect. C.C. Rewiring Winston Stubb Hse Youth Holiday and Training Centre planned (£2,800), and two schools totalling £4,750. Architect.

Eastbourne B.C. Edwards High Vacuum, Manor Royal, Crawley factory planned.

Eastgate. Tender: National Deposit Friendly Society office block. Architects, Ansell and Bailey, 12 Gray's Inn Sq, W.C.1.

Edinburgh T.C. Tender: 124 houses, Comiston housing development. Architect.

Edmonton, N. Fleetway Mnfg. Co. plan Charlton Rd factory extensions.

Enfield. Griggs and Son, 56 Victoria St, S.W.1, contractors for Gor-Ray £170,000 extensions.

Epsom and Ewell B.C. Tender: 24 West St flats. Engineer.

Exeter. J. Stanley Beard, Bennett and Wilkins, 101 Baker St, W.1, architects for Nuffield Nursing Homes Trust £100,000 nursing home, Lyndhurst Rd.

Falkirk. Gowanbank Ironworks £29,000 buildings for M. Cockburn planned.

Fife C.C. Tender: Kennoway Clinic. County Clerk.

Gillingham. Bowater Eburite Flexible Packaging plan large factory works. Farmer and Dark, Tufton St, S.W.1, architects.

Glossop. Ferrostatics, High St West, plan Surrey St factory and offices.

Ham. Wates Ltd., 1258 London Rd, Norbury, plan development of 34 acres, Ham Hse.

Havant. Marsh Plant and Machinery Co., 23 South St, Emsworth, plan New La workshops.

Hawick. Ann Howard Ltd., 154 Weensland Rd, Falkirk, plan £30,000 factory.

Hemel Hempstead. Development Corpn. plan eight Maxted Rd factories. Chief architect, H. K. Ablett, Wesbrook Hey.

Hillsborough R.D.C. Tender: 154 Milltown houses. Architect, Wm. Barklie Maxwell, 5 University Terr, Belfast 7.

Huntingdon. A. M. Gear and Assoc., 12 Manchester Sq, W.1, architects for Victaulic Co. St. Peter's Rd factory and offices.

Ilford B.C. Tender: 33 Inglehurst Gdns flats.—Tender: 33 Green La flats. Engineer.

Kesteven C.C. H. H. Adkins, contractors for £122,381 Billinghay school.—W. Foster and Sons, Wharf Rd, Grantham, contractors for £126,352 Billingborough school.

Leeds. Regional Hospital Board plan remodelling of St. Luke's, £715,000; Stanley Royd and Pinderfields extensions; maternity services (£127,000), Manygates; and radiocobalt unit, Hull Royal Infirmary.

Leamington Spa. Rayner and Fedeski, 28 Parade, architects for £21,500 Edinburgh Cres. community centre.

Leicester T.C. £89,181 Gold Hill boys' school planned.—£18,250 Eyres Monsell estate community centre proposed. Architect.

Leighton Buzzard. Cramb and Dean, 104 Belsize La, N.W.3, contractors for Camden Motors' £80,000 factory.

Liverpool. Davies Tyre Co., The Hyde, Hendon, N.W.9, plan £62,000 sq ft factory at Kirkby.

London, Percy Bilton, 52 Uxbridge Rd, W.5, contractor for £100,000 West Ferry Rd, E.14, Beecham Group depot.—Munby, Smith and Hampton, 46a King's Rd, S.W.3, architects for Christopher St, E.C.2, factory.—Young and Brown, Roman Hse, E.C.2, quantity surveyor for N.E. Metropolitan Regional Hospital Board's planned £250,000 additions to Royal Northern Hospital, Holloway Rd, N.7.—Raglan Squire and Ptnrs, Hobart Pl, S.W.1, architects for £200,000 London College of Secretaries new Park Cres premises.—W. J. Bonfield, 46 Queen Anne St, W.1, architect for New Cavendish St and Weymouth Mews offices.—Devereux and Davies, 3 Gower St, W.C.1, architects for Lanfrac Properties' Westminster Bridge Rd offices.—Montague Evans and Son, 21 Brunswick Sq, W.C.1, architects for College of Estate Management extensions.—Lewis Solomon, Kaye and Ptnrs, Thavies Inn Hse, Holborn Circus, E.C.1, architects for Bath Hse, Piccadilly, site offices.—Veale and Sanders, 19 Hanover Sq, W.1, quantity surveyors for John Princes St £70,000 shops and offices.—E. G. Lynde and Ptnrs, 41 Russell Sq, W.C.1, quantity surveyors for £75,000 Bewley (Tobacconists) Oxford St and Swallow Pl premises.—Prudential Assurance Co., Holborn Bars, E.C.1, plan £250,000 New Bond St premises.

Manchester. £150,000 old peoples' Wythenshawe homes planned by Corpn.

Newcastle T.C. Tender: 147 Newbiggin Hall estate flats. Architect.

Newcastle under Lyme. G. A. Poole, Liverpool Rd, Newcastle, contractors for £500,000 Jesshope Ltd. factory, Chesterton.

Oxford. Booth, Ledeboer and Pikheard, 9 Blackhall Rd, architects for Wolvercote Paper Mills extensions.

Perivale. F. L. Marcus, 12 Bedford Sq, W.C.1, architect for Suflex Ltd. extensions.

Petersfield. Sir John Brown, A. E. Henson and Ptnrs, 117 Sloane St, S.W.1, architects for £50,000 Raglan Developments offices.

Plymouth. Walls and Pearn, Prudential Bldgs, Armada Way, architects for Associated Engineers (Sales) Exeter St premises.

Plympton St. Mary R.D.C. Tender: 116 Plympton St dwellings and 75 garages, 48 Plymstock dwellings and 26 garages. Architect.

Portadown. Mayfair Manufacturing Co., 57 Effra Rd, S.W.2, plan factory.

Rainford. Frank Franklin and Sons, Anderson St, Wigan, plan new factory.

Ross-on-Wye. Woodville Rubber Co. plan Camp Meadow site factory.

Rugby B.C. Tender: 16 two-storey Featherbed La flats. Surveyor.

Rushden. H. W. Chapman, Oliver Cromwell Rd, plan Oak St factory.

S. Shields. Atcost Ltd., Lucknow Rd, Paddock Wood, Kent, architects for Murray Hearne Ltd. and A. I. Surtees Ltd. Maxwell St factories.—Cotton, Ballard and Blow, Haymarket Hse, Newcastle, architects for S. Newman, Commercial Rd factory.

Sandbach U.D.C. Tender: 36 flats. Eng.

Scarborough. Gregory Construction, contractors for T.C.'s 48 Manham Hill flats.—£196,000 Town Hall extension plan. Borough Engineer.

Sheffield. Bon Marche (Gloucester) plan £1,500,000 department store at The Moor.—Cole Bros., Fargate, plan Burgess St store.

Slough. Cumberland Property Investment Trust, 9 Carlos Pl, W.1, plan seven-storey Windsor Rd office/showroom block.

Southampton B.C. Tender 136 in four five-storey blocks. Redbridge Triangle. Engineer.

Stafford. Wilson Lovatt and Sons, Clarence St, Wolverhampton, contractors for £120,000 Evode factory, Common Rd.

Sunderland. Corporation plan £200,000 Plains Farm estate mental health training centre.—Gordon Jeeves, 61 Catherine Pl, S.W.1, architect for Binns Ltd.'s five-storey Borough Rd store.—Hepworth and Grandage Ltd., St. John's Wks, Bradford 4, plan 20-acre site factory.—Matkin and Hawkins, Barclays Bank Chmbrs, Fawcett St, architects for Webster and Co. Slater St factory; and for A. Cameron and Sons' Hendon Rd offices and laboratory.

Tipton B.C. Tender: 52 Ashton St housing site dwellings. Architect.

W. Hartlepool. Housing committee plan 88 houses. Borough Architect.

Waltham Abbey. Ministry of Works plan £50,000 canteen at E.R.E. works. Own architects, Abell Hse, John Islip St, S.W.1.

Wandsworth B.C. Tender: 18 houses, 14 flats, St. Ann's Hill. Architect, Sir Lancelot Keay, Oldbury Pl, W.1.

Watford. Ley, Colbeck and Ptnrs, Palmerstone Hse, Bishopsgate, E.C.2, architects for £200,000 Pinner Properties' Clarendon Rd office block.

Watford. A.A. Polishers and Platters, Loates La plan Holywell estate factory.—Mark Anthony and Sons, Chalk Hill, plan factory extensions.

Wednesfield U.D.C. Tender: 46 Ashmore Pk dwellings. Engineer.

West Drayton. Ford and Walton, Warton Rd, E.15, contractors for Compressed Paper Packing Ltd., Horton Rd extensions.

Whitehaven T.C. 50 houses proposed for UK Atomic Energy Commission.

Wokingham B.C. Tender: 57 Norreys Barn dwellings. Surveyor.

Wokingham. A. Johnson and Co., Villiers Hse, Strand, W.C.2, plan factory/offices.—Wokingham Plastics Ltd., Denton Rd, plan Eastheath factory.

Yeovil B.C. Tender: 43 houses and garages, Sunningdale estate. Surveyor.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

R. L. Buzzing and Co. Ltd., 82 Richmond Park Rd, Kingston-on-Thames, Surrey. Designers, manufacturers and vendors of domestic and industrial electrical goods, etc. Nom. cap.: £500. Dirs.: Raymond L. Buzzing and Gladys Buzzing.

Cabot Signs Ltd., 133/9 Lawrence Hill, Bristol. Electrical engineers, sign erectors, etc. Nom. cap.: £2,000. Dirs.: James A. Till, Robert F. Sprackman and Raymond A. B. Beech.

Hugh E. Daft Ltd. Electrical engineers and contractors, etc. Nom. cap.: £5,000. Dirs.: Hugh E. Daft and Mrs Edith F. Daft, 31 Eastfield Rd, Peterborough; Norman H. Daft, 107 Eastfield Rd, Peterborough.

Darwen Electrics Ltd., 153 Duckworth St, Darwen. Nom. cap.: £1,000. Dirs.: Cyril T. Thompson and Stella R. Foster.

E. A. Dolan Ltd., 269a Kingsland Rd, E.2. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Eric A. Dolan and Mrs K. Dolan.

Eden Electrical Co. Ltd., 77 Croydon Rd, Beckenham, Kent. To take over the business of an electrical contractor carried on at Beckenham as "Eden Electrical Co.," etc. Nom. cap.: £100. Dirs.: Arthur W. Mathews and Joan Hall.

E.F.C. (Electrical Engineers) Ltd., 5 Old Steine, Brighton 1. Nom. cap.: £100. Dirs.: Eric Fairbrother and Fredk. A. J. Couldery.

Electricals (Laboratory) Ltd. Manufacturers of and dealers in hospital, laboratory, scientific and surgical equipment, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: B. Bray and Donald E. Strong, Lloyds Bank Chmbrs, Collingwood St, Newcastle-on-Tyne 1.

J. R. Hodgkinson Ltd., "Conroy," Red Bank, Market Drayton, Salop. To carry on the business of electrical engineers, etc. Nom. cap.: £1,000. Dirs.: James R. Hodgkinson and Mrs Constance M. Hodgkinson.

Home Appliances (J. E. Bell) Ltd., 16 Leeds Rd, Windhill, Shipley. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,000. Dirs.: Joseph E. Bell and Enid J. Bell.

D. J. Humphrey (Electrical Contractors) Ltd., Barclays Bank Chmbrs, Grand Parade, Harringay, N.4. Nom. cap.: £100. Dirs.: Derick J. Humphrey and Mrs T. L. Humphrey.

A. L. King and Sons Ltd. Electrical, mechanical and civil engineers, etc. Nom. cap.: £1,000. Dirs.: Arthur L. King, "The Laurels," Hophurst Hill, Crawley Down, Sussex; Colin G. King, Flat 4, 17 Southend Rd, Croydon, Surrey; and Trevor M. King, "Kingsmead," 5 Willow Way, Godstone, Surrey.

Maurice Broadbent Ltd. Manufacturers of and dealers in domestic household and general electrical equipment, etc. Nom. cap.: £100. Dirs.: Maurice Broadbent and Norah Broadbent, Warburton, Emley, near Huddersfield.

McMillan and Co. (Electrical Engineers) Ltd., 3 Laurence Poutney Hill, E.C.4. Nom. cap.: £100. Dirs.: Ronald G. Dear and John E. Clenaghan.

Monogram Electric Ltd. Electricians, electrical, electronic, chemical, nuclear and general engineers, etc. Nom. cap.: £150,000. Dirs.: not named. Subs.: I. Gower Williams and F. J. Wilson, 18 Austin Friars, E.C.2.

R. E. Page Electric (Surbiton) Ltd. Nom. cap.: £100. Permt. dirs.: Raymond E. Page and Gwendoline V. Page, 98 Knollmead, Tolworth, Surrey; and Geo. E. Stevenson.

A. H. Percival and Co. Ltd., 54 Welbeck St, W.1. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £10,000. Dir.: Albert H. Percival.

Powrmatic Ltd., 40 Portland Pl, W.1. Manufacturers of and dealers in heat and raising plant, oilburners and accessories, electrical appliances, etc. Nom. cap.: £10,000. Dirs.: not named. Subs.: T. H. M. Shaw and Joseph Rosenberg.

Teddington Autocontrols Ltd., 146 Windmill Rd, Sunbury-on-Thames, Middx. Manufacturers of and dealers in domestic, industrial and engineering, controlling, indicating or recording apparatus for heating, lighting, cooking and other applications, etc. Nom. cap.: £100. Dirs.: John E. Sherlock, Stephen S. A. Sherlock and Ronald H. Seward.

Vacmobile Mfg. Co. Ltd., 43 Upper Berkeley St, W.1. Electricians, manufacturers and dealers in vacuum cleaners, etc. Nom. cap.: £1,000. Dir.: Jeffrey M. Sass.

Volatile Holdings Ltd., 101/3 Baker St, W.1. Wholesalers, retailers, importers, exporters and distributors of and dealers in refrigerators, washing machines, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: S. Soraff and Sidney Gold.

Frank Walter and Sons Ltd., 3 Pear Tree La, Little Common, Bexhill-on-Sea, Sussex. Electrical and mechanical engineers, etc. Nom. cap.: £100. Dirs.: Frank Walter, Ivy V. Walter and Basil J. D. Walter.

Western Floor Heating Ltd., 15 Dix's Field, Exeter. Electrical engineers and contractors, etc. Nom. cap.: £5,000. Permanent dirs.: Arthur G. Blow and Clifford W. Packer.

Gazette Announcements

COMPANIES ACTS

T. K. Richardson and Co. Ltd. Resolution for voluntary winding-up passed at extraordinary general meeting on 12 May. Petition for winding-up to be heard before the County Court of Liverpool, India Bldgs, Liverpool 2, on 2 June. Persons intending to appear to notify Cuff, Roberts and Co., 34 Castle St, Liverpool 2, by 6 p.m., 1 June.

Hampden Co. (Merchants) Ltd. Winding-up order dated 2 May. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 27 May, at 11.30 a.m. and 12 noon respectively.

Mica Mnfg. Co. Ltd. Creditors to send details to liquidator: N. K. Allen, Capel Hse, 62 New Broad St, E.C.2, by 6 June.

Queensbury Eng. Co. Ltd. General meeting of members to be held at 1 Drapers' Gdns, Throgmorton Ave, E.C.2, on 15 June, at 12 noon, for the purpose of having an account laid before them by the liquidator.

Wheeler and Pearce Ltd. Last day for receiving proofs for intended dividend 3 June to liquidator, P. Cardwell, 93 Queen St, Sheffield 1.

L and K Electrical Installation Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 30 May. Persons intending to appear to notify A. E. Samuels and Co., 292 High Holborn, W.C.1, by 1 p.m., 28 May.

Cowley Electrical Ltd. and **R.V.R. Components Ltd.** Mr G. Talfourd-Cook, 64/65 St. Mary's Butts, Reading, and R. A. Hawken, Bank Chmbrs, 1 John St, Bedford Row, W.C.1, appointed liquidators at extraordinary general meeting on 6 May.

Lamberts Electrical Ltd. Mr. G. Talfourd-Cook, 64/65 St. Mary's Butts, Reading, appointed liquidator at extraordinary general meeting on 6 May.

W.E.H. Electrics Ltd. Meetings of creditors and contributories to be held at Inveresk Hse, 346 Strand, W.C.2, on 1 June, at 11.30 a.m. and 12 noon, respectively.

BANKRUPTCY ACTS

Receiving Orders

Bradford. D. Cornish, electrical engineer and contractor, carrying on business as Cornish and Graham, at 6/8 Maperton Rd. Receiving order dated 16 May.

Liverpool. R. Bond, electrical dealer, carrying on business as B.B. Machines, at 361 Easton Rd, West Derby. Receiving order dated 16 May.

Intended Dividends

Ashton-under-Lyne. D. R. Kemp, electrical contractor, formerly carrying on business as Batty and Jackson at 15 Farnsworth Ave and North Mill, Katherine St, Ashton-under-Lyne. Last day for receiving proofs for intended dividend 31 May, to trustee, J. Tye, 20 Byrom St, Manchester 3.

Preston. C. S. Smith, electrical engineer and contractor, lately carrying on business at 9 Pedder St, Morecambe. Last day for receiving proofs for intended dividend 31 May, to trustee, J. A. Freeman, 8 Manchester Rd, Bury, Lancs.

Application for Discharge

High Court of Justice. M. Neidle, electrical contractor, lately carrying on business at 26 Elmer Gdns, Edgware, Middx. Order made on application for discharge on 1 April; discharged as from 1 Oct.

Release of Trustees

Durham. E. Bowes, radio and electrical engineer, carrying on business at 3 Front St, Langley Pk, Durham. Trustee: F. P. Hunnam, 30/32 Grey St, Newcastle, released as from 19 April.

Luton. L. G. Brown, dealer in household and electrical equipment, lately carrying on business at 31a Colin Rd. Trustee: H. C. Hedges, 4 Charterhouse Sq, E.C.1, released as from 1 April.

MEETINGS TO NOTE

THURSDAY, 26 MAY

INSTITUTION OF PLANT ENGINEERS (Mersey and N. Wales Branch). "Packaging and Container Engineering," E. Evans. Exchange Hotel, Liverpool. 7.15 p.m.

A.S.E.E. (Brighton, Hove and District Branch). "Variable Speed A.C. Motors." New Imperial Hotel, First Avenue, Hove. 7.30 p.m.

A.S.E.E. (Southampton Branch). "Electricity as Supplied to the Printing Trade," S. C. Bellringer. Polygon Hotel. 8 p.m.

A.S.E.E. (S. London Branch). A.G.M. Greyhound Hotel, High St, Croydon. 7.15 p.m.

FRIDAY, 27 MAY

A.S.E.E. (Aldershot Branch). A.G.M. Queen's Hotel, South Farnborough. 7.30 p.m.

A.S.E.E. (Liverpool Branch). A.G.M. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 6.30 p.m.

MONDAY, 30 MAY

BRITISH ELECTRICAL POWER CONVENTION at Bournemouth until 4 June.

ELECTRICAL TRADES' UNION. Annual Policy Conference opens at Hastings.

WEDNESDAY, 1 JUNE

A.S.E.E. (Manchester Branch). A.G.M. Engineers' Club, Albert Sq, Manchester 2. 6.45 p.m.

A.S.E.E. (N. London Branch). A.G.M. Wood Green Civic Centre, Town Hall, N.22. 7.15 p.m.

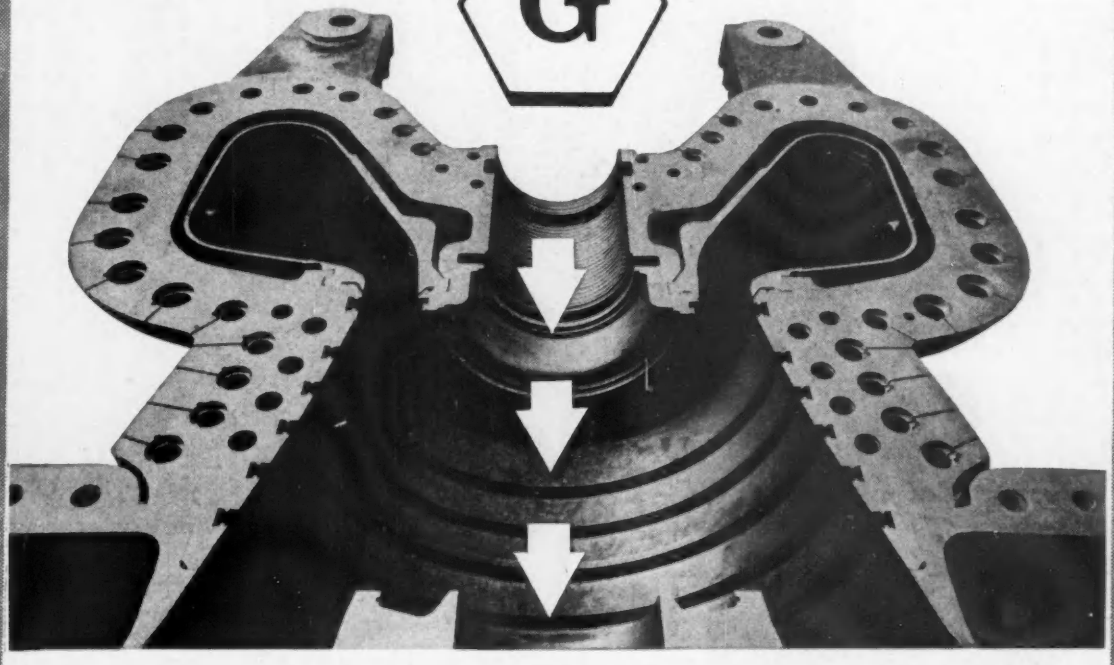
A.S.E.E. (Nottingham Branch). A.G.M. Nottingham Mechanics Institution, Trinity Sq. 7.30. p.m.

BATH AND WEST AGRICULTURAL SHOW until 4 June.

WEDNESDAY, 8 JUNE

WOMEN'S ENGINEERING SOCIETY. A.G.M. Hope Hse, 45 Gt. Peter St, S.W.1. 7 p.m.

R W G



This is the lower half of a gas turbine cylinder for a 2,500 kW gas turbo-alternator now running in a Midland steel works, converting the heat in waste blast-furnace gas into useful work. The provision of economical power is our business; and since we manufacture most of the main equipment for a power station such as boilers, turbines, alternators, condensers, feed heaters, cooling-water strainers, we are well equipped to design and carry through schemes for the efficient utilisation of any fuel.

THE RICHARDSONS WESTGARTH GROUP

Co-ordinating the activities of

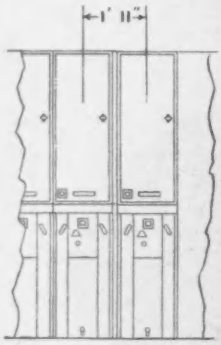
THE NORTH EASTERN MARINE ENGINEERING CO. LTD. RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.
PARSONS MARINE TURBINE CO. LTD. THE HUMBER GRAVING DOCK & ENGINEERING CO. LTD.
GEORGE CLARK (SUNDERLAND) LTD. RICHARDSONS WESTGARTH ATOMIC LTD.
RICHARDSONS WESTGARTH, INC.
ASSOCIATED COMPANY: ATOMIC POWER-CONSTRUCTIONS LTD.

RICHARDSONS, WESTGARTH & CO. LTD., WALLSEND, NORTHUMBERLAND,
and at 58 Victoria Street, London, S.W.1, 59 Mosley Street, Manchester, and 75 Buchanan Street, Glasgow. RW.51

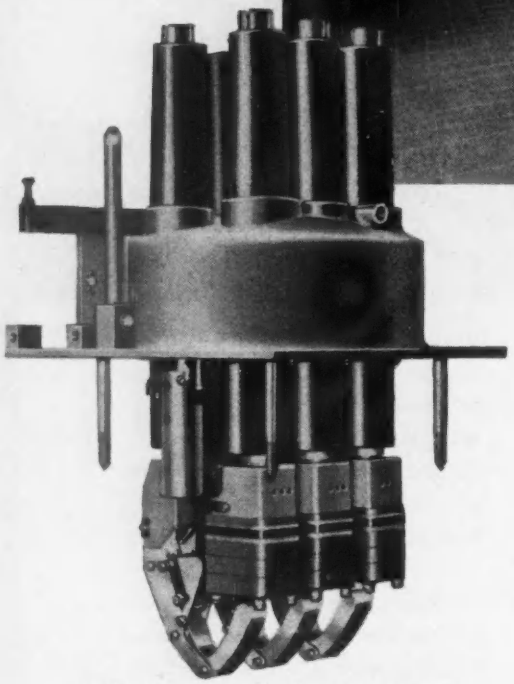
G

Now tested for 350 MVA at 11kV

AEI CLASS 'Q' SWITCHGEAR



A 6-panel, Class QF441-461 Switchboard with spring-operated mechanism.



A 1200-amp single-break oil-circuit breaker, as fitted to Class 'Q' switchgear.

The well-known AEI Class 'Q' metalclad vertically isolated switchgear, available with either air or compound-insulated busbars, and which incorporates the type JB single break oil circuit-breaker, is now available for a short circuit rating of 350 MVA at 11 kV, in addition to the existing rating of 250 MVA at 6.6 kV, on 23″ equipment centres.

For further details, write to AEI Switchgear Division, Willesden Works, Neasden Lane, London, N.W.10 or to your local AEI office.

AEI Switchgear Division

Associated Electrical Industries Limited

WILLESDEN, LONDON • TRAFFORD PARK, MANCHESTER • HIGHER OPENSHAW, MANCHESTER

F/A003

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

TENDER

Tenders are invited for the supply of:

Power Transformers

Specifications may be obtained on writing to the Purchasing Officer, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of Spain, Trinidad, W.I.

Closing date for Tenders: 20 June, 1960. (P 936)

FYLDE WATER BOARD

TENDERS are invited for electrical installation at the Board's Head Office, Blackpool.

Further particulars from Engineer to the Board, Sefton St, Blackpool. Tenders to be received not later than 16 June, 1960. (P 967)

CITY OF MANCHESTER

Davyhulme Sewage Works Extensions

TENDERS are invited for the supply, delivery and erection of 415 volt cables and auxiliary equipment for the Secondary Sludge Treatment Plant.

Tender documents returnable by 28 June, 1960, from the City Surveyor, Town Hall, Manchester 2. (P 966)

COUNTY BOROUGH OF WALLASEY

EGERTON GROVE SCHOOL EXTENSIONS AND ALTERATIONS
ELECTRICAL INSTALLATION

Amended Advertisement

TENDERS to reach the undersigned by 7 June, 1960, are invited for the abovementioned work. Specification and Form of Tender obtainable from the Borough Architect, Town Hall, Wallasey. Tender documents are being forwarded to those contractors who applied for them in response to the previous advertisement, so further application is unnecessary.

A. G. HARRISON,
Town Clerk.
(P 968)

ORMSKIRK URBAN DISTRICT COUNCIL

Sodium Street Lighting

TENDERS are invited for the supply, delivery and erection of 28 Class "A" and 67 Class "B" concrete columns, lanterns, sodium lamps, switchgear and auxiliary equipment. Specification and Schedule of Materials and Works may be obtained from the Surveyor. Tenders in plain sealed envelopes marked "Street Lighting" to be returned to the undersigned not later than 10 a.m. on Wednesday, 8 June, 1960. Lowest or any tender not necessarily accepted.

G. WILLIAMS,
Clerk of the Council.

Council Offices,
Burscough St,
Ormskirk. (P 913)

CHESHAM URBAN DISTRICT COUNCIL

Street Lighting Stage 2

TENDERS are invited for the supply and erection of No. 49 Steel Group "A" lighting columns fitted with 250 watt colour corrected mercury vapour lanterns and No. 24 Steel Group "B" lighting columns fitted with 125 watt colour corrected mercury vapour lanterns with all lamps and control gear.

Specifications and Bills of Quantities may be obtained and conditions of contract and layout drawings inspected at the office of the Engineer and Surveyor of the Council.

Tenders in plain sealed envelopes bearing the words "Street Lighting Stage 2" must be received by me not later than Saturday, 11 June, 1960.

The Council do not bind themselves to accept the lowest or any tender.

W. I. NASH,
Clerk of the Council.

Council Offices,
Chesham, Bucks. (P 893)

MINISTRY OF TRANSPORT

Consulting Engineers:
Stirling, Maynard & Partners

LONDON-EDINBURGH-THURSO ROAD, A1
ROUNDABOUT LIGHTING—STAMFORD BY-PASS

TENDERS are invited for the erection and installation of Steel Columns and Electrical Equipment for 32 Group A Mercury Street Lighting Units, together with Two Illuminated Bollards.

Form of Tender, Specification and Bills of Quantities may be obtained from the Ministry's Consulting Engineers on payment of a deposit of two guineas made payable to them to be refunded on receipt of a bona fide tender.

Drawings and General Conditions of Contract may be inspected at the Consulting Engineers' offices.

Tenders in plain sealed envelopes, endorsed "Roundabout Lighting A.1," must be received by the undersigned not later than Friday, 10 June, 1960.

The Ministry does not bind itself to accept the lowest or any Tender.

STIRLING, MAYNARD & PARTNERS,
Consulting Engineers,
8 Station Chambers,
Peterborough. (P 932)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

GENERAL ASSISTANT ENGINEER (CHEMISTS)
WILLINGTON, CASTLE DONINGTON, SPONDON AND LEICESTER POWER STATIONS
Vacancy No. 127/60.

Candidates must have had a sound technical training and previous laboratory ex-

continued in next column

continued from previous column

perience and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be in accordance with Schedule A of the National Joint Board Agreement and will be within the range £560/£700 per annum.

Candidates should state on their application if they have preference for any of the stations.

Closing date for receipt of applications: 10 June, 1960.

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 130/60.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,195/£1,270 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 10 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.
(P 953)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's South Western District at Lavender Hill, Battersea, S.W.11.

Candidates should have had a good general and technical education and be in possession of the Ordinary National Certificate. They should be neat and capable Draughtsmen with experience in one or more of the following: electrical plant layouts, electrical diagrams, building construction, mains survey and recording.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6—£660/£780 per annum, inclusive of London Allowance.

Application form from Personnel Officer, 46 New Broad St, E.C.2. Please quote Ref. PER/V/2935/T. (P 955)

THE EAST MIDLANDS ELECTRICITY BOARD

Leicester Sub- Area

SENIOR ASSISTANT ENGINEER (PLANNING)
Vacancy No. 66/60.

APPLICATIONS are invited from suitably qualified and experienced persons for the above positions.

Salary: N.J.B., Class K, Grade 4 (£1,470 x £35—£1,575 per annum).

The duties of the appointment will consist of planning, design and preparation of specifications for both underground and overhead distribution systems up to and including 33 kV, the layout of substations and the estimating and preparation of schemes for submission for approval.

Preference will be given to candidates who possess a technical qualification equivalent, at least, to the Higher National Certificate in Electrical Engineering.

Applications in writing, giving details of age, experience and present position, and quoting the above vacancy number, should be forwarded to The Manager, Leicester Sub-Area, Charles St, Leicester, within 14 days of the date of this advertisement. (P 952)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

ASSISTANT SHIFT CHARGE ENGINEER
COVENTRY POWER STATION
VACANCY No. 118/60.

Applicants are required to take charge of shift operation of boiler house plant and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of fuels and chain grate stokers.

Salary will be in accordance with Class G, Grade 9 (£860/£905 per annum), of the National Joint Board Agreement, plus shift enhancement.

Closing date for receipt of applications: 3 June, 1960.

MAINTENANCE SUPERINTENDENT
CASTLE DONINGTON POWER STATION
VACANCY No. 114/60.

Applicants must have had considerable experience of both mechanical and electrical maintenance in a large power station of advanced design. Technical qualifications to Higher National Certificate standard, or equivalent. Corporate Membership of one of the senior Engineering Institutions an advantage.

Experience in budgetary control, maintenance planning, costing and plant records desirable.

The salary will be within Class L, Grade 4 (£1,600/£1,705 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 3 June, 1960.

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
CASTLE DONINGTON POWER STATION
VACANCY No. 115/60.

Applicants must have had considerable experience in the mechanical maintenance of large modern power stations. Technical qualifications to Higher National Certificate standard in mechanical engineering, or equivalent. Experience in costing, planning and plant records desirable.

The salary will be in accordance with Class L, Grade 6 (£1,360/£1,450 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 3 June, 1960.

DEPUTY STATION SUPERINTENDENT
NORTH WILFORD POWER STATION
VACANCY No. 121/60.

Applicants should be corporate members of the Institution of Mechanical and/or Institution of Electrical Engineers, and have experience in a responsible position with the operation and maintenance of modern large capacity high pressure plant employing pulverised fuel boilers.

The successful applicant should also possess sound administrative and organising ability.

The salary will be in accordance with Class K, Grade 2 (£1,725/£1,830 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 10 June, 1960.

SENIOR DRAUGHTSMAN
(CIVIL ENGINEERING AND BUILDING)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
VACANCY No. 124/60.

Applicants for this appointment should have suitable technical training and be thoroughly conversant with the design and detailing for civil and building works, including steel and R.C. structures and foundations. The work is associated with H.V. substations and generating stations.

Salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930/£1,030 per annum.

Closing date for receipt of applications: 10 June, 1960.

These appointments will be pensionable within the terms and conditions of the

continued in next column

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Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

18 May, 1960. (P 915)

MINISTRY OF WORKS

REQUIRES

Electrical Draughtsmen for Duty in London

APPLICANTS should be capable of designing Lighting and Power distribution for various types of building. A knowledge of control wiring, H.T. and substation design is also desirable.

Qualifications:

O.N.C. or equivalent standard.

Salary:

£570/£900 per annum—London (slightly less elsewhere), according to age and experience. Prospects of promotion to higher posts.

General Conditions:

Five-day week, 3½ weeks' annual leave in addition to statutory holidays. Part-time day release for higher technical training in approved cases. Opportunities for non-contributory pensionable posts.

Applications:

to The Chief Engineer, Ministry of Works (A), Room 435, Abell Hse, John Islip St, London S.W.1. State age, experience, training and qualifications. Interviews at Regional Offices where possible. (P 937)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Area Board Headquarters,

THIRD ASSISTANT ENGINEER
TECHNICAL SECTION
CHIEF ENGINEER'S DEPARTMENT
NEWCASTLE UPON TYNE

Applicants should preferably be Corporate Members of I.E.E. and should have had experience in testing, commissioning and maintenance of electrical measuring instruments and protective equipment. A knowledge of design of electronic devices and circuits an advantage.

Salary: Schedule B, Grade 6, £925/£1,140. N.J.B. Conditions of Service.

Wear Sub-Area

SENIOR DRAUGHTSMAN
AT SUB-AREA HEADQUARTERS
SUNDERLAND

Considerable experience of drawing office work, preferably in association with Electricity Supply Industry is required. Applicants should possess a good general and technical education and be competent to carry out site surveys, prepare working drawings and make the necessary structural calculations for building and reinforced concrete work for buildings usually associated with the industry. Architectural experience would be an advantage.

Salary: Schedule D, Grade 4, £930/£1,030. N.J.B. Conditions of Service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (P 941)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Edinburgh and Borders Area

GENERAL ASSISTANT DISTRICT
COMMERCIAL ENGINEER
LOTHIANS DISTRICT
SALARY: N.J.B. SCHEDULE A, CLASS G, GRADE 11, £765/£810 p.a.

APPLICATIONS are invited for the appointment of a General Assistant District Commercial Engineer in the Lothians District, based on Musselburgh, and should be submitted on the standard form not later than 13 June, 1960.

Duties will include the installation and operation of Street Lighting Maintenance, liaison with Local Authority Street Lighting Engineers and the maintenance of records. Applicants should have a knowledge of good street lighting practice and be able to carry out photometric tests. Possession of an O.N.C. or equivalent technical qualifications will be an advantage.

Conditions of service are in accordance with the National Joint Board Agreement for the Electricity Supply Industry and the successful candidate, subject to satisfactory evidence of health, will require to become a contributor to the Board's Superannuation Scheme.

The successful candidate will require to reside within a reasonable distance of the District Office at Musselburgh.

C. H. A. COLLYNS,
Manager.

52 Melville St,
Edinburgh 3. (P 933)

KENYA GOVERNMENT
Education Department

TECHNICAL INSTRUCTOR (ELECTRICAL)

APPOINTMENT either on probation to permanent and pensionable establishment or on contract for one tour with gratuity at rate 13½% of total salary drawn. Normal tour 36/45 months. Commencing salary according to age and experience up to maximum in scale (including Inducement Addition) £813 rising to £1341 a year. Outfit Allowance £40 payable in certain circumstances. Free passages. Liberal leave.

Candidates under 45 years of age, must possess C. and G. Final Certificate, or O.N.C., in Electrical Engineering and have had practical experience and preferably teaching experience. Duties will be teaching students taking C. and G. and O.N.C. courses in the Kenya Polytechnic, Nairobi.

Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/51021/EE. (P 938)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointment:

FOURTH ASSISTANT ENGINEERS
SYSTEM OPERATION DEPARTMENT
THAMES NORTH GRID CONTROL
REDBOURN, NR. ST. ALBANS, HERTS

Salary N.J.B., Class AX/EX within the range of Grade 7/8, £735 x £25—£965/£1,065 per annum.

The commencing salaries will be within the above range at a point commensurate with qualifications and experiences.

Applicants should have qualifications to Higher National Certificate standard and should be prepared ultimately to undertake shift duties in the Area Grid Control Room. Some steam Generating Station experience is desirable.

Forms of application (AE6/ACT) may be obtained from any Divisional Office of the Board, and should be addressed to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 4 June, 1960, quoting Staff Vacancy Number 1207. (P 908)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

CROYDON "B" POWER STATION

Vacancy No. 122/60.

ASSISTANT ENGINEER (CONTROL)

CANDIDATES should have had experience in the operation of modern generating plant and or control room work and should have had technical training to O.N.C. level. Salary N.J.B. Class J, Grade 13 £895/£950 per annum including London Allowance and Shift Allowance.

Vacancy No. 92A/60.

ASSISTANT ENGINEER (EFFICIENCY)

Applicants should have had experience of Power Station practice and should have had technical training to O.N.C. level.

Salary: N.J.B. Class J, Grade 14, £750/£795 per annum including London Allowance.

Applications giving age, details of training, experience, etc., and quoting vacancy No. should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, Surrey, to arrive by 8 June, 1960.

W. H. DUNKLEY,
Divisional Controller.
(P 931)

CITY OF SALISBURY

Southern Rhodesia

VACANCY FOR ELECTRICAL ENGINEER (DISTRIBUTION)

SALARY SCALE: £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d PER ANNUM.

APPLICATIONS are invited for the Fixed Establishment post of Electrical Engineer (Distribution) in the Salisbury Municipal Electricity Department, on the scale £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d per annum. No allowances are payable.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and £1,614 7s 6d per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

The person appointed may be required to undertake stand-by duties on a roster of approximately one in five, for which payment at the rate of £5 5s per week of duty will be made.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Davis and Soper Ltd., 52-54 St. Mary Axe, London E.C.3, to whom applications must be submitted on or before 18 June, 1960. (P 914)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Pembrokeshire District (Haverfordwest) in the West Wales Area of the Board.

The salary for the position will be in accordance with Class E, Grade 11 (£650/£700) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to Mr W. E. Richardson, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, Pembrokeshire, so as to arrive not later than Saturday, 11 June, 1960.

Envelopes should be marked Assistant Engineer S.V.52/60. (P 916)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Surrey Suburban District at Wimbledon, S.W.19.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsmen and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, lay-out of plant in transformer chambers, mains survey and recording of mains work.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £660/£780 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2. Please quote ref. PER/V/2942/T. (P 907)

MANCHESTER REGIONAL HOSPITAL BOARD

Architectural, Surveying and Engineering Staff

A SUBSTANTIAL expansion of the hospital capital building programme offers valuable opportunities to ambitious Architects, Surveyors and Engineers. Vacancies exist in the following posts:

(a) ASSISTANT REGIONAL ARCHITECT
£1,825/£2,175 A YEAR

(b) PRINCIPAL ASSISTANT ARCHITECTS (SCALE II)
£1,655/£2,035 A YEAR

(c) SENIOR ASSISTANT ARCHITECTS
SENIOR ASSISTANT QUANTITY SURVEYORS
£1,300/£1,600 A YEAR

(d) ASSISTANT ARCHITECTS
ASSISTANT SURVEYORS (LAND AND QUANTITY)
£905/£1,310 A YEAR

(e) ARCHITECTURAL ASSISTANTS
SURVEYING ASSISTANTS (LAND AND QUANTITY)
£625/£900 A YEAR

(f) ARCHITECTURAL DRAUGHTSMEN
£475/£685 A YEAR

(g) ENGINEERS (ELECTRICAL, MECHANICAL AND HEATING AND VENTILATING)
£910/£1,600 A YEAR

(h) ENGINEERING ASSISTANTS
ENGINEERING DRAUGHTSMEN
£600/£1,070 A YEAR

Candidates for posts under (a), (b), (c), (d) and (g) should possess full professional qualifications and for posts under (e) and (h) intermediate qualifications. Architectural Draughtsmen must have had at least three years' previous experience. All posts superannuable. Application forms, obtainable from the Secretary, Manchester Regional Hospital Board, Cheetwood Rd, Manchester 8, should be returned by 30 June, 1960. (P 911)

THE SOUTH WALES ELECTRICITY BOARD

SURVEYOR DRAUGHTSMAN

APPLICATIONS are invited for the position of Surveyor Draughtsman in the Port Talbot District of the Swansea and West Central Area of the Board.

The salary for the position will be in accordance with Schedule D, Grade 6 (£620/£740) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, Glam, so as to arrive not later than Saturday, 11 June, 1960.

Envelopes should be endorsed "Surveyor Draughtsman 94/60." (P 909)

KENT EDUCATION COMMITTEE

North West Kent College of Technology

Electrical Engineering Department

GRADE B ASSISTANT

REQUIRED to teach Electrical subjects of National Certificate standard, Radio and Television Servicing and Telecommunication courses. Specialised experience in Radio Servicing would be an advantage. Industrial and/or teaching experience essential. Salary: £700 x £27 10s/£1,150 p.a. Forms of application are obtainable from the Principal at the College, Miskin Rd, Dartford, to whom they should be returned as soon as possible. (P 910)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (TECHNICAL)

REQUIRED at No. 3 Sub-Area Headquarters at Chester. Salary: £965/£1,025 per annum (N.J.B. K/10).

Applicants should have had experience of testing and commissioning of H.V. electrical plant and its associated protective gear. A knowledge of telecommunications, electronics and fault calculations would be an advantage. They should be in possession of suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity Hse, Newgate St, Chester, must be forwarded not later than 7 June, 1960. (P 956)

SCHOOL OF ENGINEERING

Kumasi College of Technology, Ghana

APPLICATIONS are invited for the post of SENIOR TECHNICAL ASSISTANT in the Department of Electrical Engineering.

Applicants should hold the Higher National Diploma or Certificate or equivalent, and should have experience in operation and maintenance of electronic equipment. The College prepares students for the B.Sc. External degree of London University.

Contract appointments are normally for five years, and may be renewed. Three months' notice of resignation of an appointment is required on either side.

The contract salary scale is £1,017 10s x £44—£1,475 10s per annum.

In addition children's allowances are paid up to a maximum of three, and a gratuity at the end of the contract at the rate of £150 for each year of satisfactory service. The entry point is fixed according to qualifications and experience.

The College is fully residential and members of staff are housed in pleasant modern bungalows on the spacious campus; climate and living conditions are good.

Annual leave with three free return passages in four years is granted to members of staff and their families.

Application forms and an Information Brochure may be obtained from the Assistant Registrar, Kumasi College of Technology, 29 Tavistock Sq, London W.C.1, who will also be glad to answer any questions about these appointments. The closing date for applications is mid-June. (P 906)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

1. SENIOR ASSISTANT ENGINEER DEVELOPMENT
CHIEF COMMERCIAL OFFICERS' DEPARTMENT—HEAD OFFICE, BRISTOL

Salary according to Class AX, Grade 3, £1,365 x £25—£1,490 per annum, of the N.J.B. Agreement, with further progression to £1,595.

The successful candidate will be responsible to the Assistant Chief Commercial Officer (Development) and his duties will include the preparation of marketing and load development plans for commercial expansion; technical and commercial reports; the investigation of H.P. and similar schemes and methods of sales promotion; the technical training of commercial staff including production of training programmes and the preparation and delivery of talks.

He will also be required to deal with manufacturers of domestic appliances and commercial equipment, including commercial catering, and all aspects of consumer service.

Candidates should have wide commercial marketing experience and the possession of Graduate or Associate membership of the I.E.E., or equivalent qualification, is desirable.

2. FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (SUPPLY)
MID-CORNWALL DISTRICT

Salary according to Class F, Grade 5, £1,025 x £20—£1,085 per annum, of the N.J.B. Agreement.

The successful applicant will be responsible to the District Commercial Engineer for the Supply Section of the Commercial Department, and his duties will include Rural Development, Consultative Council and Parliamentary correspondence, housing estates, tariffs, technical services (floor warming, commercial catering, etc.), public lighting, contracting and testing.

Applicants must have good experience in District commercial work and the possession of a technical qualification will be an advantage.

3. THIRD ASSISTANT DISTRICT ENGINEER
(PROTECTION) BRISTOL

Salary within Class K, Grade 9, £1,025 x £20—£1,085 per annum, of the N.J.B. Agreement.

The successful candidate will assist the District Protection Engineer in the installation, commissioning, testing and maintenance of protective equipment, battery installations and telecommunications. Duties will include the supervision of manual workers.

Applicants should be experienced in system operation and have specialised knowledge of protection systems.

Possession of qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is essential and the ability to drive a car would be an advantage.

4. THIRD ASSISTANT DISTRICT ENGINEER
(CONSTRUCTION)
WEST CORNWALL (CAMBORNE)

Salary within Class G, Grade 9, £860 x £15—£905 per annum, of the N.J.B. Agreement.

The duties of the successful applicant will comprise all types of construction work including H.V. and L.V. overhead lines and underground cables, preparing material schedules, programming of work and supply of materials, reports and statistics and maintenance of progress records. The successful candidate may be required to undertake standby duties and to assist in general engineering duties in the District.

The possession of the Higher National Certificate in Electrical Engineering and a current driving licence are desirable.

5. SECOND ASSISTANT DISTRICT ENGINEER
(PLANNING) CREWKERNE

Salary within Class E, Grade 7, £860 x £15—£905 per annum, of the N.J.B. Agreement.

The successful candidate will primarily be required to assist in the planning and technical work in connection with the erection of new substations, mains extensions and reinforcement schemes; the preparation of estimates and capital applications, and also to carry out any other duties as may be assigned to him from time to time; he will be required to participate in a standby rota.

Graduate Membership of the Institution of Electrical Engineers or equivalent qualification will be an advantage.

6. SECOND ASSISTANT DISTRICT ENGINEER
(CONSTRUCTION, OPERATION AND MAINTENANCE) CREWKERNE

Salary within Class E, Grade 7, £860 x £15—£905 per annum, of the N.J.B. Agreement.

The successful candidate will primarily be required to assist in the preparation of construction programmes, material schedules and supervision of the construction and maintenance

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of overhead lines, laying of underground mains and the installation of substation equipment for voltage systems up to and including 33 kV; he will also be required to carry out any other duties allocated to him from time to time, and participate in a standby rota.

Applicants should have had a sound technical training with experience of construction, operation and maintenance and of protective systems and cable fault location. Graduate Membership of the Institution of Electrical Engineers or equivalent qualification will be an advantage.

7. THIRD ASSISTANT DISTRICT ENGINEER
BATH

Salary within Class G, Grade 9, £860 x £15—£905 per annum, of the N.J.B. Agreement.

The duties of the successful candidate will be to assist generally in the planning, construction, operation and maintenance of overhead and underground lines, and substations—for voltages up to and including 33 kV. The person appointed will be required to undertake standby duty.

Possession of appropriate technical qualifications at least equal to the Higher National Certificate in Electrical Engineering is necessary, and a current driving licence is desirable.

8. THIRD ASSISTANT DISTRICT ENGINEER
(PLANNING) TAUNTON

Salary within Class G, Grade 9, £860 x £15—£905 per annum, of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the District Engineering Department and in planning research and the technical work of a large distribution system on voltages up to and including 33 kV. Duties will include the examination of system loads, preparation of capital applications for reinforcement and new development schemes, system calculations and load forecasting and work in connection with the preparation of the capital budget.

Applicants should have a broad technical training and experience of construction and operation of systems up to and including 33 kV and may be required to undertake standby duties. Possession of the Higher National Certificate in Electrical Engineering or its equivalent will be an advantage.

9. THIRD ASSISTANT DISTRICT ENGINEER
(PROTECTION AND MAINTENANCE)
WEST DEVON (BIDEFORD)

Salary within Class E, Grade 9, £765 x £15—£810 per annum, of the N.J.B. Agreement.

The duties of the successful applicant will include the installation, commissioning and testing of protective gear within the District; the carrying out of pressure tests, fault location and assistance with the commissioning and maintenance of transformers, switchgear and ancillary apparatus, etc.

Candidates should possess at least the Ordinary National Certificate in Electrical Engineering. The possession of a current driving licence would be an advantage.

10. THIRD ASSISTANT DISTRICT ENGINEER
(PLANNING) WEST DEVON (BIDEFORD)

Salary within Class E, Grade 9, £765 x £15—£810 per annum, of the N.J.B. Agreement.

The successful candidate will be required to assist in the planning and costing for rural and mains extensions up to and including 33 kV together with planning work on new housing estates. The duties will also include the carrying out of negotiations with Planning Authorities, Post Office, etc.

Applicants should possess at least the Ordinary National Certificate in Electrical Engineering. Possession of a current driving licence would be an advantage.

11. FOURTH ASSISTANT DISTRICT
ENGINEER
TORBAY-NEWTON ABBOT BRANCH

Salary within Class G, Grade 11, £765 x £15—£810 per annum, of the N.J.B. Agreement.

The duties of the successful applicant will be to assist in the supervision of maintenance work on the distribution network within the Newton Abbot Branch area and, when required, to supervise H.V. and L.V. construction works undertaken by the Branch organisation. The candidate appointed may be required to undertake standby duty.

Candidates should have had experience in the erection and maintenance of overhead and underground H.V. and L.V. networks and maintenance of substations. Possession of the Higher National Certificate in Electrical Engineering will be an advantage. Possession of a current driving licence is desirable.

12. FOURTH ASSISTANT DISTRICT
ENGINEER—PLYMOUTH

Salary within Class G, Grade 11, £765 x £15—£810 per annum, of the N.J.B. Agreement.

The duties of the successful candidate will be to assist in the construction, operation and maintenance of the distribution networks. He will be required to undertake standby duties.

Possession of Higher National Certificate in Electrical Engineering and experience of overhead and underground H.V. and L.V. networks and substations are required, and the ability to drive a car is desirable.

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13. GENERAL ASSISTANT DISTRICT
ENGINEER—PLYMOUTH

Salary according to Class G, Grade 12, £710 x £15—£755 per annum, of the N.J.B. Agreement.

The successful candidate will be required to give general assistance to the Mains Engineer (Construction), particularly on service installation and minor maintenance work. He may also be required to undertake standby duties.

The possession of the Higher National Certificate in Electrical Engineering is desirable, as is possession of a current driving licence.

APPLICATIONS FOR THE ABOVE POSTS TO BE MADE ON STANDARD FORM AE6/ACT OBTAINABLE BY POSTCARD ONLY FROM AS FOLLOWS:

1. Head Office Post: Establishments Officer, S.W.E.B., Electricity Hse, Colston Ave, Bristol 1.
2. Mid-Cornwall Post: District Manager, S.W.E.B., St. Petrocs, Bodmin, Cornwall.
3. Bristol Post: District Manager, S.W.E.B., Electricity Hse, Colston Ave, Bristol 1.
4. West Cornwall Post: District Manager, S.W.E.B., 13 Basset Rd. Camborne, Cornwall.
5 and 6. Crewkerne Posts: District Manager, S.W.E.B., East St, Crewkerne.
7. Bath Post: District Manager, S.W.E.B., Electricity Hse, The Old Bridge, Bath.
8. Taunton Post: District Manager, S.W.E.B., The Parade, Taunton, Somerset.
9 and 10. West Devon Posts: District Manager, S.W.E.B., 20 High St, Bideford, Devon.
11. Newton Abbot Post: District Manager, S.W.E.B., Electric Hse, Union St, Torquay.
12 and 13. Plymouth Posts: District Manager, S.W.E.B., Elliott Rd, Prince Rock, Plymouth.

Closing date for receipt of completed applications for all these posts is Saturday, 11 June, 1960. (P 957)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

ASSISTANT ENGINEER

REQUIRED at Hams Hall "B" Power Station, N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.12, £860/£905 per annum, plus 10% shift allowance.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 121/60MD on forms AE6 which are available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks, to whom they should be returned to arrive not later than 8 June, 1960. (P 960)

YORKSHIRE ELECTRICITY BOARD
No. 2 (Huddersfield) Sub-Area

SECOND ASSISTANT ENGINEER
(CONSTRUCTION)

APPLICANTS should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. Considerable experience in the design and construction of substations and overhead and underground networks in industrial, urban and rural areas is required. Experience of this kind at 33 kV and 66 kV will be an advantage.

Salary: N.J.B. Class L, Grade 7, £1,270 x £30—£1,360 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 10 June, 1960.

No. 3 (Sheffield) Sub-Area

ECCLESFIELD DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent, and have had experience in the work of a District Engineering Department.

Salary: N.J.B. Class G, Grade 9, £860 x £15—£905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 10 June, 1960. (P 959)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER
TECHNICAL SECTION
ENGINEERING DEPARTMENT
AREA BOARD HEADQUARTERS
MANCHESTER 8

THE duties will include a variety of technical investigations, and a knowledge of underground cables, overhead lines, substation equipment and protective systems will be an advantage.

Applicants should hold the H.N.C. in Electrical Engineering or equivalent.

Salary Scale: £925/£1,170 p.a. Class AX/EX, Grade 6. N.J.B. Conditions.

Application forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 10 June, 1960.

(a) THIRD ASSISTANT DISTRICT ENGINEER
SOUTH WEST DISTRICT, ALTRINCHAM

(b) THIRD ASSISTANT DISTRICT ENGINEER
CENTRAL DISTRICT, MANCHESTER

(c) FOURTH ASSISTANT DISTRICT ENGINEER
SOUTH DISTRICT, CHEADLE

The duties will include assisting in the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, keeping of substation records, etc.

Applicants should preferably hold H.N.C. in Electrical Engineering and should have had practical experience in substation work, operation, cable laying and jointing, etc. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: Post (a) £965 x £20—£1,025 p.a. Grade J.9; Post (b) £910 x £15—£955 p.a. Grade H.9; Post (c) £765 x £15—£810 p.a. Grade G.11. N.J.B. Conditions.

Application forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, and returned to him by 10 June, 1960. (P 951)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

BEDFORD DISTRICT
SECOND ASSISTANT ENGINEER
123/60.R.

Candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems including substations.

Salary: N.J.B. Class G, Grade 7 (£965/£1,025).

Apply by letter to the Manager, Bedford District, Eastern Electricity Board, Prebend St, Bedford, by 10 June, 1960.

Fens Sub-Area

THIRD ASSISTANT ENGINEERS
(OPERATIONS AND MAINTENANCE)
127/60.N.

Vacancies exist for two Third Assistant Engineers in the Sub-Area, one based at Cambridge and one at Peterborough. The duties include the organisation of routine inspection and maintenance of all lines, plant and equipment in the two regions of the Sub-Area, and applicants should have had experience in this field. Technical education to Grad. I.E.E. standard would be an advantage.

Salary: N.J.B. Class J, Grade 10 (£910/£955).

GENERAL ASSISTANT ENGINEER
126/60.N.

A vacancy exists for an engineer of good technical education in the Construction (Preparation) Section of the Sub-Area Engineer's Department. The duties include the survey and preparation of line schedules for 33 kV and 11 kV lines throughout the Sub-Area, and the position offers a good opportunity to gain experience in this field.

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Salary: N.J.B. Class J, Grade 15 (£655/£700).

For these appointments apply by letter to the Secretarial Officer, Eastern Electricity Board, Fens Sub-Area, Milton Hall, Milton, Cambridge, by 10 June, 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS, LONDON N.14
GENERAL ASSISTANT ENGINEER
(COMMUNICATIONS)
OPERATION AND MAINTENANCE SECTION
(REF. 969)
125/60.N.

The successful applicant will be required to assist with the planning, installation and maintenance of all classes of telephone and radio communication equipment.

Salary: N.J.B. Grade 14 (£960/£1,005), inclusive of London Allowance.

SENIOR DRAUGHTSMAN
CIVIL ENGINEERING AND BUILDING
SECTION (REF. 968)
124/60.R.

Candidates should have had experience in the preparation of drawings and calculations for reinforced concrete for building and civil engineering work required for 33/11 kV substations and be capable of carrying out site surveys and supervising staff. Possession of the Ordinary National Certificate (Building) or equivalent qualification will be an advantage.

Salary: N.J.B. Schedule D, Grade 5 (£830/£940), inclusive of London Allowance.

For these appointments apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet Hse, Southgate, London N.14, by 9 June, 1960.

HENDON DISTRICT
THIRD ASSISTANT ENGINEER (REF. 971)
128/60.N.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class G, Grade 9 (£860/£905), plus London Allowance.

Apply by letter to F. A. Moinet, M.I.E.E., Manager, Eastern Electricity Board, 137/139 Brent St, Hendon, London N.W.4, by 8 June, 1960. (P 958)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

OXFORD District of No. 2 (Newbury) Sub-Area. Salary: N.J.B., Class J, Grade 9 (£965/£1,025 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1208, not later than 6 June, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B., Class G, Grade 11 (£765 x £15—£810 per annum), with N.J.B. Conditions of Service, but present trends indicate that the District may be re-classified to Class H with effect from 1 April, 1960 (£815 x £15—£860 per annum).

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1190, not later than 6 June, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B., Class F,

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Grade 9 (£815 x £15—£860 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1175, not later than 6 June, 1960.

ASSISTANT ENGINEER
(LOCAL)

Swindon District of No. 2 (Newbury) Sub-Area, located at Cirencester. Salary: N.J.B., Class F, Grade 11 (£710 x £15—£755 per annum), with N.J.B. Conditions of Service, but present trends indicate that the District may be reclassified to Class G with effect from 1 April, 1960 (£765 x £15—£810 per annum).

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution equipment, and possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1168, not later than 6 June, 1960.

SENIOR SHOWROOM ATTENDANT

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.C., Grade 2 (£640 x £20—£700 per annum). N.J.C. Conditions of Service.

Applicants must be capable of supervising staff and should have had experience in all showroom duties. They should have a sound knowledge of domestic and commercial apparatus, window displays, sales procedure, the application of tariffs and consumer service.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1186, not later than 6 June, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (P 954)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Vacancy Ref. 37/60)

REQUIRED for the Bathgate District of this Area. Salary: N.J.B. F.5, £1,025 x £20—£1,085 per annum.

Superannuated post. Applications on the standard form, obtainable from the undersigned, to be returned not later than 6 June, 1960.

JAMES G. CURTIS,
Manager.

"Woodlands,"
St. Ninians Rd,
Stirling. (P 950)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

KINGSTON GENERATING STATION
OPERATION SUPERINTENDENT
Vacancy No. 125/60.

CANDIDATES should indicate their experience of controlling staff and knowledge of station operation; also their knowledge of test procedures and statistical controls. Evidence is required of ability to conduct experiments and prepare reports.

Salary: N.J.B., Class G, Grade 5 (£1,145/£1,220 per annum), including London Allowance.

Applications giving age, details of experience, present position, etc., should be sent to the Station Superintendent, Kingston Power Station, Down Hall Rd, Kingston upon Thames, Surrey, to arrive by 9 June, 1960.

W. H. DUNKLEY,
Divisional Controller.
(P 946)

THE NATIONAL INSPECTION COUNCIL FOR ELECTRICAL INSTALLATION CONTRACTING

REQUIRES an INSPECTING ENGINEER for an area covering parts of the South and West of Scotland. Salary £1,050 rising to £1,150 per annum, together with car allowance, travelling and subsistance allowances and superannuation. Applicants, who should preferably be under 45 years of age and hold a Higher National Certificate, must have had supervisory experience in electrical installation contracting, a thorough knowledge of the I.E.E. Regulations for the Electrical Equipment of Buildings and of good wiring practice, and be prepared to reside within the area. Applications by 31 May, 1960, to the Secretary, N.I.C.E.I.C., Aldine Hse, 10/13 Bedford St, London W.C.2. (P 912)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER

REQUIRED at Stourport "A" and "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K8, £1,095/£1,170 per annum, plus 10% for shift duties.

A sound technical training and practical power station experience are required, and a knowledge of unit plant with p.f. boilers, operating at high pressure and high temperature will be an advantage. Appropriate technical qualifications desirable.

Apply, quoting Vacancy No. 123/60MD on forms AE6 which are available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport, Worcs, to whom they should be returned to arrive not later than 8 June, 1960. (P 963)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT SENIOR COMMERCIAL ASSISTANT (SALES)
SUTTON DISTRICT

SALARY: £980 x £25—£1,055 per annum plus London Weighting under N.J.C. Grade 6. Superannuable.

The successful applicant will be responsible for the co-ordination of the seven showrooms in the district, stocking of major appliances, sales promotion, the control of outside representatives and demonstrators, the direction of sales campaigns, exhibitions and publicity and other general commercial duties.

Applications, quoting ET and naming two referees, must be made on forms from District Manager, Seeboard, 52 High St, Sutton, Surrey, by 8 June, 1960.

ASSISTANT DISTRICT ENGINEERS
DORKING AND EPSOM DISTRICT

Salary: £815 x £15—£860 per annum under N.J.B. Class F, Grade 9. Superannuable. Applicants should be suitably qualified and have had training and experience in construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The position will entail standby duties. Consideration will be given to a car allowance. Suitable accommodation may be available.

Applications, quoting ET and naming two referees, must be made on forms from District Manager, Seeboard, 56 South St, Dorking, by 8 June, 1960.

DISTRICT COMMERCIAL ASSISTANT
EASTBOURNE DISTRICT

Salary: £640 x £20—£700 per annum under N.J.C. Agreement, Grade 2. Superannuable. Applicants should be able to deal with consumers' enquiries and to give advice on supply matters, tariffs, appliances and electrical installations for all classes of domestic and commercial installations. Thorough knowledge of electrical appliances and the ability to quote for small contracting work is necessary.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, Electric Hse, Grove Rd, Eastbourne, by 8 June, 1960.

GEORGE WRAY,
Secretary.
(P 949)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

ASSISTANT ENGINEER

REQUIRED at Hams Hall "A" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K12, £860/£905 per annum, plus 10% shift allowance.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 120/60MD on Forms AE6, which are available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwickshire, to whom they should be returned when completed not later than 8 June, 1960. (P 962)

GOVERNMENT OF ADEN

ELECTRICAL AND MECHANICAL ENGINEER
PUBLIC WORKS DEPARTMENT

TO take charge of the Electrical and Mechanical branches of the Department, and to advise the Director of Public Works on technical matters in those spheres.

Contract appointment. Salary within range £1,232/£2,004. Gratuity. Free passages. Furnished quarters at moderate rent. Children's allowances. Generous home leave. Candidates must be either A.M.I.Mech.E. or A.M.I.E.E. with 10 years' extensive experience in Electrical and Mechanical engineering.

Write Director of Recruitment, Colonial Office, London S.W.1, giving full names, age, qualifications and experience, quoting BCD112/2/018/D10. (P 939)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division

FOURTH ASSISTANT ENGINEERS (SERVICES)
CANTERBURY DISTRICT

CANDIDATES must possess either an Engineering Degree, the H.N.C. in Electrical Engineering or equivalent qualifications and be interested in automatic protective gear and control gear associated with major electrical plant in Generating Stations and Substations. Salary: Class AX/DX, Grade 8, £735/£935 per annum, with prospect of promotion to Grade 7, £840/£1,040 per annum, subject to satisfactory progress. Applications giving age, details of experience, present position, etc., to Personnel Officer, South Eastern Division, Central Electricity Generating Board, Lower Ham Rd, Kingston upon Thames, to arrive by 9 June, 1960.

W. H. DUNKLEY,
Divisional Controller.
(P 930)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

THIRD ASSISTANT ENGINEERS (CONTROL)

REQUIRED for shift duties at the Birmingham Grid Control Centre. N.J.B. service conditions, superannuable appointments, salary within Schedule B, Grade 6, Class AX/FX, £925/£1,050 ultimately rising to £1,200 plus 10% shift allowance.

Applicants should have received a sound education and basic training, with subsequent experience in the electricity supply industry, preferably in power stations. H.N.C. or equivalent qualifications essential. Successful applicants will be required to assist the Control Engineer in all functions necessary for the proper control of a large portion of the grid system.

Apply, quoting Vacancy No. 117/60MD on forms AE6 which are available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, to whom they should be returned when completed not later than 8 June, 1960.

Applicants for Vacancy No. 56/60MD will be reconsidered. (P 961)

LONDON ELECTRICITY BOARD

SENIOR DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's North Western District at Hampstead, N.W.3.

Candidates should have had a good general and technical education, possess the Ordinary National Certificate in Building or its equivalent, and be capable of supervising Engineering Draughtsmen and other Drawing Office staff. They must be capable of preparing drawings and structural calculations for building and reinforced concrete work mainly associated with the construction of Transformer Chambers within new and existing buildings.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 5, £830/£940 per annum inclusive of London Area Allowance.

Application form obtainable from Personnel Officer, 46 New Broad St, E.C.2. Please quote ref. PER/V/2934/T. (P 940)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in the South Wales Division:

FOURTH ASSISTANT ENGINEER
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 134/ET/60.

Salary: AX/DX 7, £840/£1,040 per annum or AX/DX 8, £735/£935 per annum, according to experience.

Applicants should possess the Higher National Certificate (Electrical) or equivalent qualifications and have had experience in automatic and line transmission telephone apparatus. Knowledge of remote control, telemetering or V.H.F. radio equipment would be an advantage.

ASSISTANT SHIFT CHARGE ENGINEERS
USKMOUTH "B" POWER STATION
NEAR NEWPORT, MON
Vacancy No. 149/ET/60.

Salary: K.8, £1,095/£1,170 per annum, plus 10% shift enhancement.

Experience in a modern power station essential. Appropriate engineering qualifications and a regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 10 June, 1960. (P 948)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

North Staffordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(LEEK/CONGLETON DISTRICT)

Duties will include assistance in the construction, operation and maintenance of H.V. and M.V. overhead and underground mains and substations, and in the planning of system reinforcement and extensions. Technical qualifications desirable. Salary: £965/£1,025 per annum (N.J.B. Grade G.7).

Apply, by letter, within 10 days, stating age, experience, qualifications and present position to Mr C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

Central Gloucestershire Sub-Area

SALES REPRESENTATIVE (MALE)
(DEAN FOREST DISTRICT)

Duties will include advice to consumers on matters concerning supply, tariffs, apparatus sales, wiring and installation thereof. Salary: £525/£625 per annum (N.J.C. Grade 1). A training scheme is in operation and salary is paid during training.

Apply, by letter, within 14 days, stating age, qualifications, experience and present salary to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

F. W. CATER,
Secretary.
(P 947)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointment in the Electrical Department:

FOURTH ASSISTANT ENGINEER
REDBOURN, NR. ST. ALBANS, HERTS

Salary: N.J.B. Class AX/EX, within the range of Grades 7/8, £735 x £25—£1,065 p.a.

Applicants should possess a Higher National Certificate or equivalent, and should have had experience in the maintenance of communication equipment comprising automatic telephone system, V.F. equipment, remote indication and control system, and cold cathode switching circuits.

The applicant appointed will be required to reside within a reasonable daily travelling distance of Redbourn.

Applications quoting Reference S.V. No. 1289, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 4 June, 1960. (P 965)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division

Vacancy SW/AV/59/60.

SENIOR DRAUGHTSMAN (ELECTRICAL)

REQUIRED in the Electrical Department, at Divisional Headquarters, Bristol.

Superannuation Scheme. Salary: N.J.B., Schedule D, Grade 4, £930/£1,030 or Grade 5, £790/£890 per annum, according to qualifications and experience.

The successful candidate will be required principally to prepare electrical layout drawings for outdoor grid substations but general adaptability is considered important. Technical education to H.N.C. is desirable.

Vacancy SW/AV/62/60.

MAINTENANCE ENGINEER
(MECHANICAL)

Required at Portishead "B" Power Station.

Superannuation Scheme. Salary: N.J.B., Class K, Grade 5, £1,360/£1,450 per annum.

Candidates should have served an apprenticeship and have had experience with the maintenance of modern P.F. fired boilers, turbines and coal and ash handling plant. Experience of oil-fired boilers an advantage. Good organising ability essential. Preference will be given to candidates who are corporate members of the appropriate recognised professional institutions or who hold equivalent qualifications.

Vacancy SW/AV/63/60.

GENERAL ASSISTANT ENGINEER
(OPERATION)

Required at Portishead "B" Power Station, near Bristol.

Superannuation Scheme. Salary: N.J.B., Class K, Grade 13, £815/£860 per annum, plus £90 Shift Allowance.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Previous applicants need not re-apply.

Applications on form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 4 June, 1960. Please quote appropriate vacancy number. (P 917)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointment:

GENERAL ASSISTANT ENGINEER
PETERBOROUGH GENERATING STATION

Salary: Class F, within the range of Grades 14/12, £560 x £15—£700 per annum, plus £90 per annum Shift Allowance, whilst engaged on shift duties.

The commencing salary will depend upon the duties and responsibilities.

Duties include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a generating station and provide a suitable

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basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, quoting Reference No. S.V. 1345, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 11 June, 1960. (P 964)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern, London and South Eastern Region

STAFF VACANCY NOTICE 11/60.

POWER STATION SUPERINTENDENT
DUNGENESS POWER STATION

APPLICATIONS are invited for the appointment of Power Station Superintendent at Dungeness Nuclear Power Station.

Applicants should have a thorough technical and practical training followed by wide experience in the operation and maintenance of modern power station plant. Importance is attached to the financial and human relations aspects of such operation and the successful candidate would be expected to have vision and adaptability to new ideas.

Applicants should preferably possess a University Degree in relevant subjects and be Corporate Members of the Institution of Mechanical Engineers and/or the Institution of Electrical Engineers. Whilst knowledge of nuclear operations is desirable, this is not essential as suitable training can be given.

After receiving any nuclear training considered necessary the successful candidate would be required to spend a period of approximately twelve months in the post of Chief Assistant Engineer to the Nuclear Operation Engineer at Board Headquarters, Friars Hse, London S.E.1, after which he would proceed to site.

The salary for this post will be £3,000 per annum.

Applications quoting Vacancy Number 11/60, experience, present position and salary, should be forwarded to the Regional Secretary, Eastern, London and South Eastern Region, Lergon Hse, Horseferry Rd, Westminster, London S.W.1, not later than 14 June, 1960. (P 976)

CENTRAL ELECTRICITY
GENERATING BOARD
NORTHERN PROJECT GROUP

Applications are invited for the following vacancy, based in the first instance at TRAWSFYNYDD NUCLEAR POWER STATION SITE, NORTH WALES.

SECOND
ASSISTANT ENGINEER
(PROGRAMMES & PROGRESS)

Applicants should be familiar with the problems relating to the planning and progressing of power station construction and have sufficient knowledge of the detailed construction and erection of power station plant to enable them to assess and report upon the progress of plant erection at site.

Membership or qualifications leading to membership of an appropriate professional institution will be an advantage.

Salary within range £1,195 by £50—£1,545 per annum. National Joint Board conditions of service. Superannuation scheme. The Board may assist in obtaining accommodation if necessary.

Application forms available from the Administrative Officer, Northern Project Group, Central Electricity Generating Board, Agecroft Rd, Pendlebury, Swinton, Manchester, to be returned by 31 May, 1960. Envelopes marked "Confidential—Vacancy".

(P 922)

AGENT required by the London area by a firm manufacturing domestic electrical appliances—must have five connection amongst all the wholesalers in London and the Home Counties.—Apply giving full details to Box No. 7869, Electrical Times. (P 935)

SUPERVISOR

Established Electrical Contractors in N.W. London require supervisor capable of estimating for and carrying through Contracts for industrial and public authority work. Contributory Pension Scheme.—Box No. 7871, Electrical Times. (P 943)

G.E.C.

SENIOR EDITORIAL STAFF

The Publicity Department of The General Electric Co. Ltd. at Birmingham is extending its activities and is looking for two senior editorial men (25-35 years of age).

(1) An electrical engineer (university degree or equivalent) with experience and ability in technical writing, capable of undertaking the preparation of copy for engineering publications and for the technical press covering all aspects of the heavy electrical industry. This position calls for a high standard of writing but does not involve responsibility for production.

(2) A publications editor with an engineering background, capable of preparing material for promotional and general literature. This position demands the ability to supervise literature through all stages of production and calls for appreciation of layout and typography.

Salary commensurate with experience.

Applicants are invited to reply in writing, giving salary required and details of their experience, to:

The Staff Manager,
THE GENERAL ELECTRIC CO. LTD.,
Witton,
BIRMINGHAM, 6

(P 919)

Monsanto
Regd.

MONSANTO CHEMICALS LIMITED

ASSISTANT ELECTRICAL ENGINEER

Men, aged 30 years or over, with design and practical experience of electrical installation as found in the heavy chemical and petroleum industries, are invited to apply for a post of Assistant Electrical Engineer in the Engineering Department in London.

Minimum qualifications H.N.C. and Corporate Membership of the Institution of Electrical Engineers.

Excellent salary and career prospects; non-contributory pension scheme and other benefits.

Please send written applications giving details of age, qualifications and experience to DL 140, Personnel Department, Monsanto Chemicals Ltd., Monsanto Hse, 10/18 Victoria St, London S.W.1. (P 945)

A. J. SMITH, CONSULTING ENGINEER, requires SENIOR and SEMI-SENIOR ELECTRICAL ENGINEER for the design and supervision of a variety of electrical installations. Four weeks holiday per year, subsidised meals, sick pay scheme and non-contributory pension. Please send full details of qualifications, training and experience, together with approximate salary required, to 19 Bolsover St, London W.1, marking the envelope "Confidential". (P 928)

ELECTRICAL ENGINEER (QUALIFIED) required for editorial staff of ELECTRICAL TIMES. Previous editorial experience not essential, but some familiarity with writing desirable. Superannuated post. Write stating age and salary required: The Editor, Sardinia Hse, Sardinia St, W.C.2. (P 969)

ELECTRICAL CONTRACTORS require an estimator for industrial and commercial installations. Only fully experienced men who are conversant with all types (including FLP) need apply.—Please write stating experience qualifications and salary required to Box No. 7873 Electrical Times. (P 944)

ELECTRICAL DESIGN ENGINEER required to work with minimum supervision on interesting power and lighting schemes for major building projects. H.N.C. level of ability required. Apply in writing giving full details of age, experience and salary required to: Norman and Dawbarn, Architects and Consulting Engineers, 7 Portland Pl, London W.1. (P 861)

J. & P. CAPACITOR DEPARTMENT

Johnson and Phillips Ltd. have a vacancy in their Capacitor Department for a YOUNG MAN holding H.N.C. Good opportunity for a progressive man to work in a modern, well equipped factory. Excellent canteen facilities, pension scheme, etc. Applications giving full particulars of training and experience together with age to: **Employment Manager, Johnson and Phillips Ltd., Charlton, London S.E.7.**

(P 970)

UNITED KINGDOM
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require an

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AT CHAPELCROSS
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Near ANNAN, DUMFRIESSHIRE

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Applicants must have served a recognised engineering apprenticeship. Experience in a conventional power station is desirable and possession of an O.N.C. or equivalent may be an advantage.

Salary between £925 (at age 30) and £1,105.

Contributory Superannuation. Staff Housing scheme.

Send postcard to Personnel Manager at the above address for application form quoting reference G.41/J.8.

Closing date: 13 June, 1960.

(P 918)

EDITORIAL ASSISTANT for Electrical Engineering Journal (London). Engineering or Science degree and some engineering experience necessary. Journalistic knowledge desirable, but those with literary ability would be considered. Good prospects for advancement. Pension scheme. Age approx. 25-30. Salary accor. quals. and exp., but commencing at approx. £850/£1,000 if within the stated age range.—Box No. 7875, Electrical Times. (P 974)

SALES REPRESENTATIVE required for the London area by a firm manufacturing domestic electrical appliances—must have live connections amongst all the wholesalers in London and the Home Counties.—apply giving full details to Box No. 7867, Electrical Times. (P 934)

HOSPITAL DESIGN ENGINEERS

EXPANSION OF BUILDING PROGRAMME

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

PROFESSIONAL ENGINEERS required for the staff of the Regional Engineer, James Galloway, M.I.MECH.E., M.I.E.E., M.I.H.V.E.

The posts are permanent and pensionable and offer considerable career prospects owing to the vast expansion of the hospital building programme. Those appointed will be members of a team designing the engineering services for new hospitals, extensions, etc.; they will work under the general control of an experienced professional engineer, but they will themselves be responsible for the design and management of individual schemes. The work is complex in nature and extremely interesting and offers a challenge to the engineer who wants more than the usual run of job.

Applicants should be A.M.I.Mech.E., or A.M.I.E.E., or A.M.I.H.V.E., but Graduate Members of these Institutions will be accepted provided that in the case of the Institution of Heating and Ventilating Engineers they have passed Sections A and B of the Institution examination.

SALARIES will be within the range of £910/£1,600 plus £40-£50 London Weighting. The minimum point of entry for Corporate Members of the major Institutions is £1,160 plus £50 London Weighting. A bar exists at £1,400 plus £50 beyond which it is necessary to be A.M.I.Mech.E. or A.M.I.E.E., and Graduates do not proceed beyond £1,205 plus £50 until they have obtained Corporate Membership when continuance up the scale is automatic.

It is expected that these posts will be accepted by the professional institutions as leading to Corporate Membership provided other conditions have been fulfilled. A scheme for study leave is in process of inauguration.

APPLY, stating age, qualifications (with dates) and experience, with names of two referees, to the Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Ter, London W.2, quoting reference 823. Enquiries by telephone or visit by appointment to the Board's headquarters offices would be welcome. Tel. AMBassador 8011, Ext. 330. (P 929)

ELECTRICAL SUBSTATION OPERATOR

required at

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Applications are invited for this responsible post involving operations on the Establishment's ELECTRICAL DISTRIBUTION SYSTEM.

Duties include operation, isolation and earthing down on 11 kV and MV systems, relay and oil testing, keeping records and issuing MV access permits.

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Applicants should have served a recognised engineering apprenticeship or have had equivalent training and have practical experience with substation type equipment.

O.N.C. in electrical engineering subjects or equivalent an advantage. Temporary shift duties may be required occasionally to cover abnormal system conditions.
Housing and contributory pension schemes.

Send POST CARD for application form to Senior Recruitment Officer (1689/49), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks. (P 921)

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Five-day week. Contributory pension scheme. Applications, which will be treated in strict confidence, should be made in writing stating age, experience, salary required, etc., to Managing Director, Denco Works, Hereford.

(P 862)

JUNIOR ELECTRICAL ENGINEER required to assist in the development and laboratory testing of Induction Watthour Meters and Associated Test Equipment. Minimum educational requirement H.N.C. (Electrical). Write giving full details of experience to the Personnel Manager, Sangamo Weston Ltd., Cambridge Rd, Enfield, Middx. (P 844)

TRANSFORMER REPRESENTATIVE for the Electronic and Industrial Transformer fields. Preference will be given to a person already engaged in a similar capacity. Salary plus commission. Car will be supplied.—Willesden Transformer Co. Ltd., Manor Park Rd, N.W.10. ELGar 5445. (P 728)

TRANSFORMER AND POWER CAPACITOR ENGINEERS

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TRANSFORMER DESIGNER for: transformers and L.F. Chokes. (a) Laminated and C core pattern up to 5 kVA; (b) Power Transformers up to 500 kVA. Salary according to age and experience. Five-day week. Contributory Pension Scheme. Apply: Willesden Transformer Co. Ltd., Manor Park Rd, N.W.10. ELGar 5445. (P 727)

DRAUGHTSMAN required for Consulting Engineers' office, to assist in the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (P 924)

SPECIFICATION WRITER/ENGINEER. A vacancy exists with Sangamo Weston Ltd., at Enfield, for a young man having a light electrical engineering background and educated to H.N.C. (Electrical) standard. Work entails preparation of specifications of electrical measuring instruments to meet customers' requirements and liaison between development laboratories and contracts department.—Write giving full particulars of experience, etc., to the personnel Manager, Sangamo Weston Ltd, Cambridge Rd, Enfield, Middx. (P 927)

THE BRITISH LIGHTING COUNCIL requires ENGINEER for development work in lighting calling for imagination, personality, and an ability to write technical copy and an aptitude for public speaking. Based on London he will be expected from time to time to travel throughout the country. Degree or equivalent academic qualifications desirable. Salary £900/£1,300; contributory superannuation scheme. British Lighting Council, Brettenham Hse, 16-18 Lancaster Pl, London W.C.2 (P 926)

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(P 923)

ELECTRICAL ENGINEER

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ELECTRICAL ENGINEER required for Consulting Engineers' office, to carry out the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (P 925)

SUPERVISING ELECTRICAL ENGINEER required for permanent post with large electrical contractor. Pension scheme in operation. Staff bonus. Five-day week. Must be well experienced man on tendering for industrial and commercial installations.

Write in strict confidence with full details of age and experience to: The Manager, Rashleigh Phipps and Co. Ltd., 1 Kingsley Terr, Newcastle upon Tyne 4. (P 972)

TECHNICAL SALES REPRESENTATIVES required, to operate from our Midlands Area office, for Instruments and Process Control Apparatus (electrical and electronic). Good experience in this work essential and H.N.C.(E) or equivalent desirable. Preferred age 25-35 years. Applications, giving details of experience and salary required, should be addressed to: Evershed and Vignoles Ltd., c/o 58 Oxford St, Birmingham 5. Ref.: 129. (P 973)

YOUNG ELECTRICAL ENGINEER of good personality and H.N.C. standard, required for interesting internal contract engineering work involving telemetering and automatic control equipment.

Previous experience in this field not essential, but successful candidate must have a flair for light current relay circuit design.

Write briefly to: Personnel Manager, Evershed and Vignoles Ltd., Acton La, Chiswick, W.4 (Ref.: 115b). (P 971)

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required by

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at their Works at Grangemouth. Minimum qualifications: Higher National Certificate. The salary will be in accordance with age and experience, and there is a non-contributory Pension Scheme in operation. Replies, in writing, to be addressed to the Administrative Officer, British Hydrocarbon Chemicals Ltd., Bo'ness Rd, Grangemouth. (P 942)

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Please write giving details of qualifications and experience to Dept. G.P.S., Marconi Hse, 336/7 Strand, London W.C.2, quoting reference ET 0097E. (P 920)

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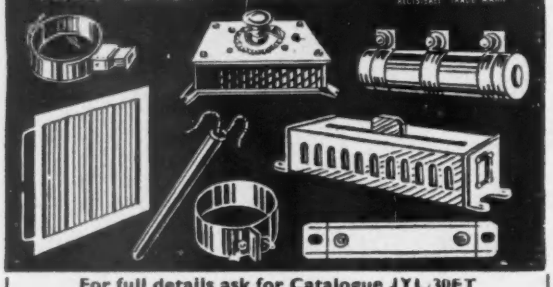

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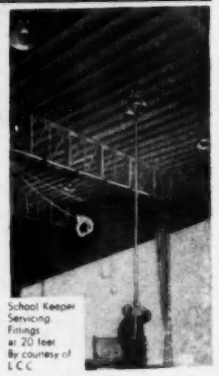

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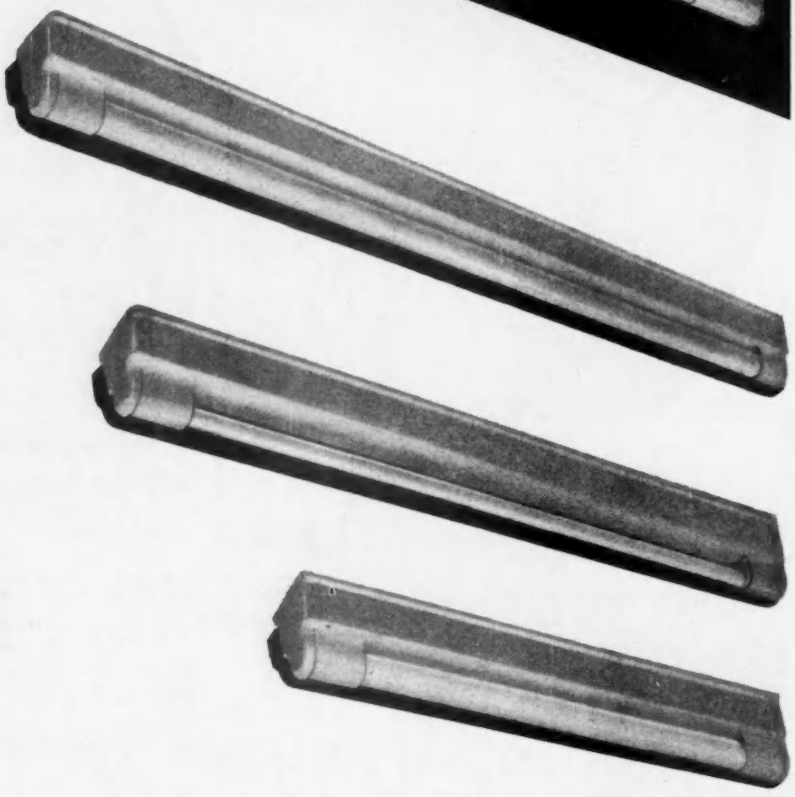

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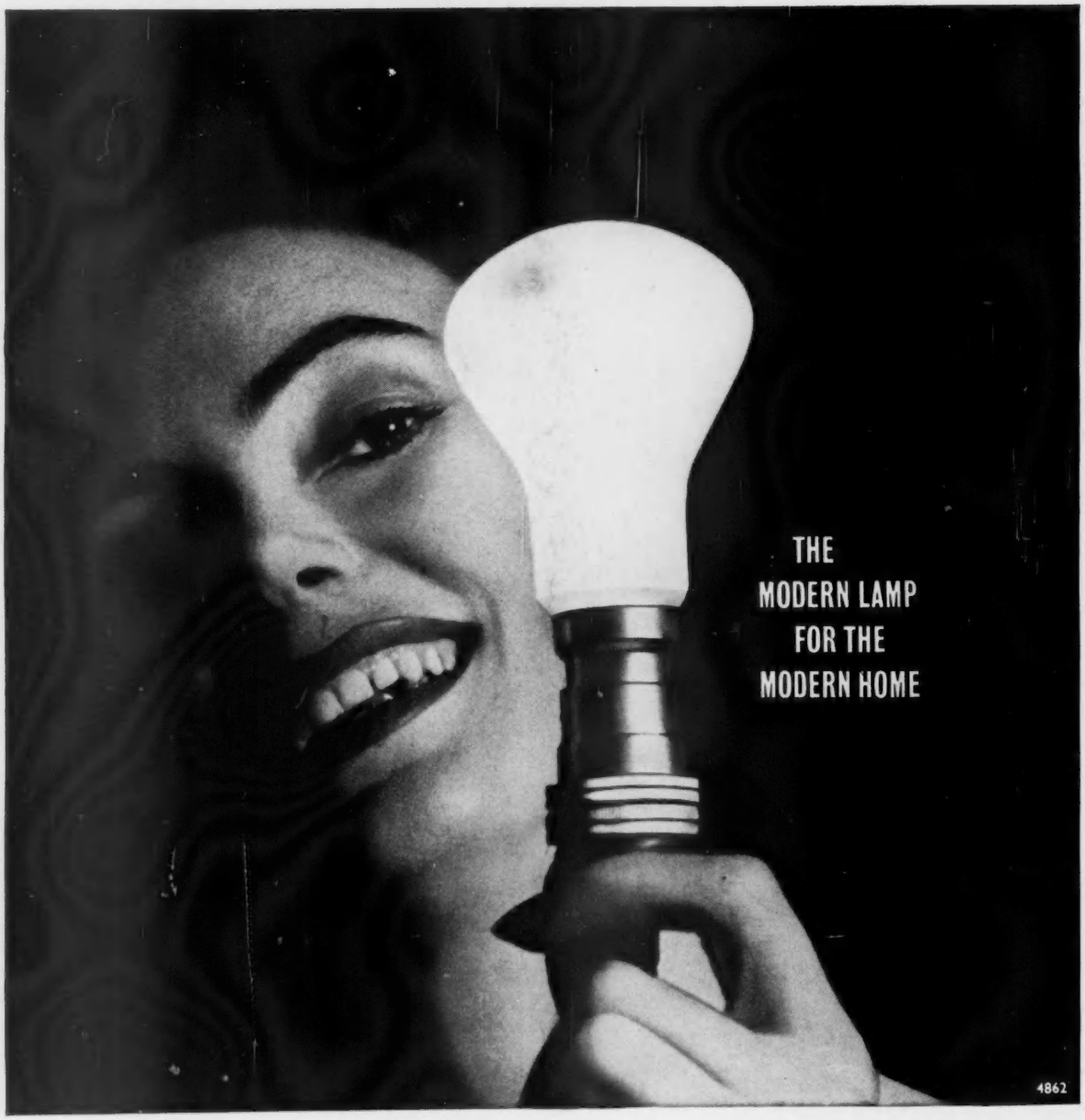
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